



FRIDAY, JAN. 10.

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Contributions.

Hydraulic Forging.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Will you kindly ask some of your readers to give me the results of their experience with hydraulic forged iron? I have been searching for some records of the relative merits of hammered and hydraulic pressed wrought iron, and have as yet found nothing conclusive or satisfactory. Recently I have heard it stated that car wheels that are hydraulic forged are not as good as those that are hammer forged. Personally, I have observed the fractures of a large number of hydraulic forged vertical-plane coupler knuckles, and I have found them to have a most peculiar appearance. The material seems to break like cast iron or steel, and not at all like the forgings of wrought iron which we are accustomed to see used for various purposes. Can you explain the cause of this?

X. X.

Mr. Mallet on Compounds.

128 BIS, BOULEVARD DE CLICHY, PARIS.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have pleasure in sending to you by this mail several devices relative to the compound locomotives of my system of the most recent designs. In a few days I shall send you an explanatory note relative to those designs and other information.

I read with surprise in a late number of the *Railroad Gazette*, on the authority of Messrs. Klein and Lindner, the assertion, at least singular, that my efforts to make an engine start smoothly and without shock in all positions of the cranks have had no effective results. Such an assertion is simply ridiculous, and would indicate complete ignorance on the part of the authors of the history of the compound locomotive. The first compound locomotives constructed in 1876 for the Bayonne & Biarritz Railroad have been performing all of the functions of a locomotive for thirteen years and are still giving complete satisfaction. They have traveled in all to the present time about 1,000 English miles and transported 10,000,000 travelers. The large number of compound locomotives running in Russia (of which I send you a photograph) are made after my system, and date from 1880. There are some, then, that have nine years' service. Engines of the same system are running in various countries and nobody has ever had to complain of the manner in which they start. All Americans who came to the Exposition in Paris could see in Machinery Hall a locomotive of my system—compound—exhibited by the Administration of Railroads of the French government. I think this fact sufficient to make plain the small value of the assertion of Messrs. Klein and Lindner that I had not arrived at an effective result in starting smoothly. If I had only obtained a result showing that one could make a compound locomotive of two cylinders of different diameter, with only an exhaust from the low-pressure cylinder, that would have sufficient power for pulling and sufficient expansion of steam to secure better economy, I should have rendered a great service to railroad economy; and the German engineers, who have only seen the difficulties incident to following the route that I had traced for them, should show gratitude instead of seeking to efface the results of my labors.

Messrs. Klein and Lindner may think to help their so-called system by running down that of others; I think they do harm. If I say "so-called system," it is because the arrangement that they offer is the oldest that has been proposed. It is explained in the clearest manner for the four-cylinder compound locomotive in the patent—Dawes, A. D. 1872, 20th day of June, No. 1857, locomotive engines. Here is the passage: "I also in some cases employ one or more small valves in connection with the boiler and the steam chest of the larger cylinders,

whereby the engine driver can cause at certain times, such as starting from stations, shunting, and at other times the steam to act directly upon all the pistons; but I do not only keep this valve and aperture very small, but I also arrange it so that the starting or reversing lever only, or some other part of the valve gear connected therewith, shall be able to open it when pushed to the extreme distance or limit for either forward or backward movement of the engine which occurs in such times as before named, and this valve being self-driven, and therefore shut at all other times, no danger can occur from its use."

A. MALLETT.

The Warping of Lumber.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Since sending you my last on the warping of wood I have made a number of additional observations without finding any reason to believe that it is not the rule that wood will, under all but the most extraordinary conditions, warp into a curve opposite to the curve of the rings of growth.

Assuming this to be the fact, we must conclude that there is a reason for it; but as to that, at present, we can only theorize. That class of vegetation, specified as exogenous, gains most of its increase by the addition of layers of wood on the outside immediately under the bark, called rings of growth, and which are generally supposed to indicate the age in years of the tree, and the thickness of the rings to show the character of the season or of the soil in which the tree stands. Both these points, however, have been seriously questioned, especially concerning the age. The number of rings in the sapwood certainly shows that the outside ring is not the only one that carries the season's flow of sap, and as it is from the sap that the accumulations of fibre are made, it would appear that all of the rings in the sapwood probably gain at least some growth during each season, and the amount of this growth probably varies from the outer to the inner rings of the sapwood, being least at the inner rings and ceasing entirely at the outer ring of the heartwood. It must be evident, then, that if any of the rings of growth inside the outer ring increase in thickness, it must have the effect of stretching any rings outside of the one so increasing; and it is evident that the outer surface of any ring so strained must be stretched to a greater degree than the inner surface of the same ring. It is probable that such a strained condition of the fibres is never entirely neutralized, in spite of the fact that nature always tends to accommodate itself to any unusual conditions; and that as soon as a slab of wood is cut from a log and the continuity of the rings broken, the elastic stress in the outer fibres of the rings comes into action with less resistance, and draws the outer (so to speak) surface of the slab together, thus causing a warp contrary to the curve of the rings.

That all the rings of the sapwood carry sap each season there can be little doubt. I remember reading a number of years ago of an experiment by one of our eminent scientists whose name (if I could recall it) is a guarantee. He sawed horizontally into a tree and inserted into the cut a sheet of metal into which had been cut his initials (like a stencil); as the plate was inserted the letters were filled with a soluble colored powder. As the sap ran up and down it dissolved this powder, and carried the coloring material with it. The tree was cut down after several seasons and sawed across in various places, and wherever cut the initials were found, showing that the sap followed more than the outer rings only, and that there was no lateral connection between the capillary tubes. I have known also of the outer ring of growth of a tree being cut through all around the trunk without destroying the life of the tree, though that operation is usually fatal, probably because the greater amount of the life's blood of the tree is near the bark.

CHAS. J. BATES.

The Safety of Trainmen.

In order to collect opinions on the subject of legislation for the safety of trainmen, we sent out, after the appearance of our editorial on this subject, Dec. 20, a circular asking the following questions:

- (1) When should compulsory equipment with air brakes and automatic couplers be begun?
- (2) At what rate should it proceed, and should it be by percentage per annum of all freight equipment, or as new stock is built, or as cars go in for general repairs?
- (3) Could the roads be required, after some date fixed, to have enough cars air braked in each train to control the train?
- (4) Do you approve of our suggestions as to the kinds of brake and coupler to be used?

The results of our inquiry have already been summarized in an editorial published last week. It will be of interest, however, to many readers to know more in detail the opinions of some of those who have replied and whose answers we feel at liberty to use. The exact phraseology of the replies is not always reproduced, as we have endeavored to condense them as much as possible.

General E. P. Alexander, President Central Railroad & Banking Co., of Georgia: (1) Fix no time for beginning, but not less than ten years from date of passage of the law for completing the equipment. Twelve years

would be but reasonable because of the enormous expense involved. The amount of rolling stock will be doubled in the next ten years, and the cost of the changes in the old stock and of equipping the new will be \$150,000,000 or more. (2) No rate should be specified. Details once entered into would be endless and cause confusion and litigation; would require an enormous organization and would work hardship to the weak roads. The moral effect of the fixed date ahead at which all cars must be equipped would force as rapid adoption of good standard patterns as can practically be accomplished. (3) Such a requirement would be vague, would breed litigation and be superfluous and unreasonable. The change once begun, the economy and interest of each road would force it as fast as practicable. There are many other necessities for continued change and improvement in matters equally vital with this, and if this one is forced by litigation there will be danger of hazardous economy in other particulars. For this reason I deprecate any governmental interference anywhere. (4) Legal requirements should be limited simply to an automatic coupler and a power brake.

Chicago, Burlington & Quincy Railroad: (1) We are of the opinion that compulsory equipment with air brakes for the present should be confined to engines. There is no use putting them on cars if they are not to be used, and they cannot be used unless the engines throughout the country are equipped with apparatus to use them. We are of the opinion that new equipment alone should be fitted with automatic couplers. Both should be done at once. (2) We think that all engines, as they pass through the shops for general or light repairs, should be fitted with air brakes, both to their drivers and tenders; also that all new freight equipment or rebuilt freight cars should have automatic couplers. A law of this kind will probably be all that the manufacturers can at present carry out, unless they resort to the manufacture of some cheap and inferior product, which would result in destroying the very object sought after—viz., the safety of trainmen.

John C. Gault, General Manager, Cincinnati, New Orleans & Texas Pacific: This is a question which requires a good deal of money, and one in which I do not believe state or national legislation is necessary. The railroads themselves are acting as rapidly as they can. There is nothing in the Interstate law that gives the Commission any right or power in the premises.

John W. Cloud, Secretary Master Car Builders' Association: (1) Time of beginning should not be compulsory. (2) Rate of equipment should not be prescribed, only the time of completion for interstate traffic. (4) Yes.

C. J. Ives, President and General Superintendent Burlington, Cedar Rapids & Northern: (1) If compulsory, it should begin at once. (2) All new stock and, say, 20 per cent. of the old stock. (3) Do not think it necessary, as air brakes would be used as soon as possible. (4) I do.

John Kirby, General Master Car Builder, Lake Shore & Michigan Southern: (1) Jan. 1, 1891. (2) All new freight cars and five per cent. of the old equipment per annum. (3) The railroads would be sufficiently interested to do this to get the benefit of the large expenditure. (4) I do.

Pennsylvania manager: (1) The sooner the better, although I do not believe such action is a legitimate function of our government; but I believe it is inevitable. (2) As new stock is built or goes in for repairs. General repairs I should construe as meaning rebuilding. (3) Very doubtful. It would interfere with destination classification, and require so much additional shifting as to make it impracticable. (4) Yes.

S. R. Ainslie, General Superintendent, Northern Pacific: (1) At once; no road can afford to run freight trains without air brakes and close couplers. (2) All new equipment and old as fast as taken in for repairs. (3) The date should be fixed sufficiently in advance to give time for equipment. (4) Yes.

W. A. Scott, General Superintendent Chicago, St. Paul, Minneapolis & Omaha: (1) Never; railroads should be left to attend to their own business as they can best afford. (2) If begun, should proceed only so fast as the railroads are able to secure the betterments. (3) Impracticable. (4) Yes.

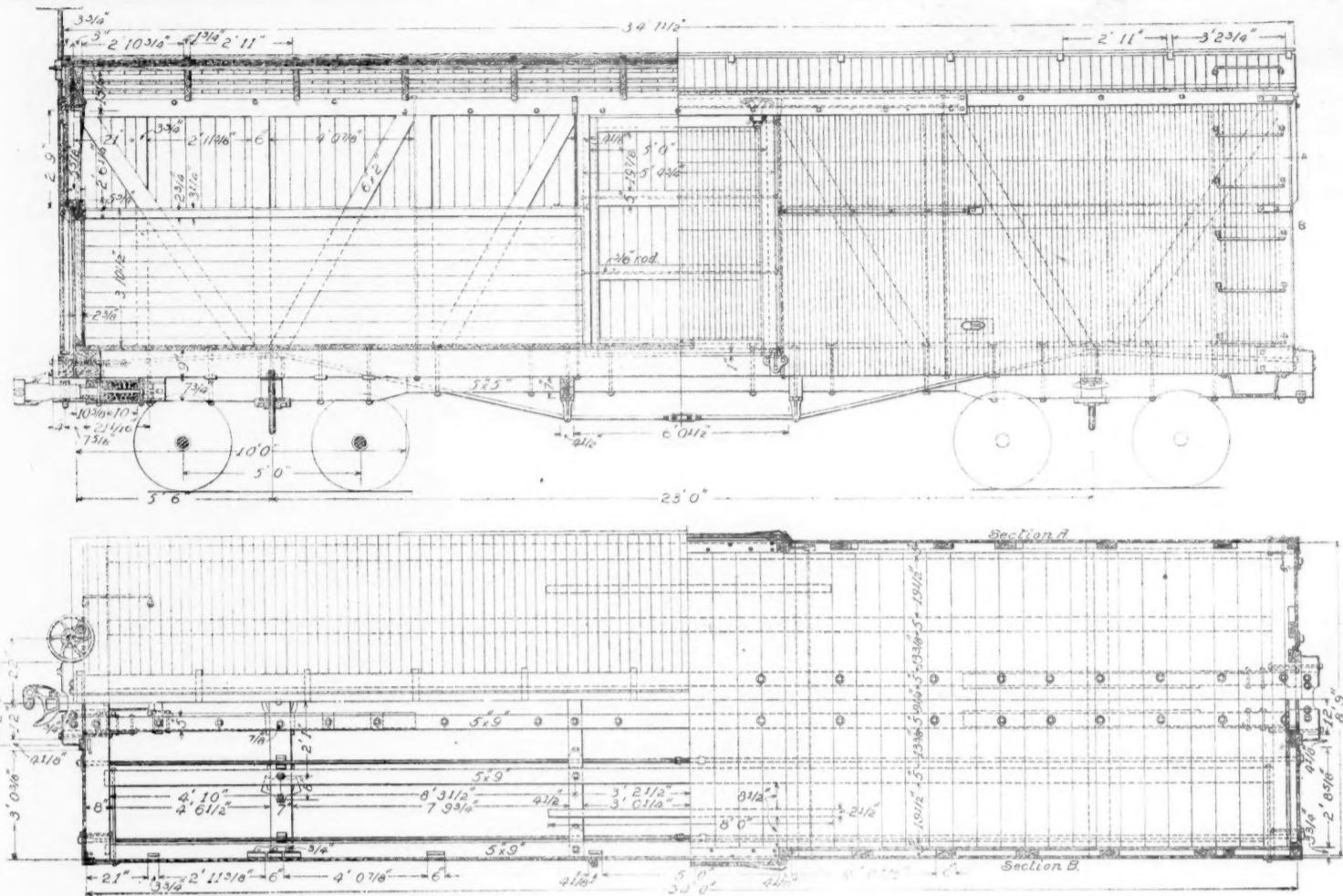
A trunk line manager: Our company is putting on automatic couplers as fast as the cars are repaired or built, and has commenced the use of power brakes. Our opinions are formed and being acted on, and we do not care to take part in the discussion.

An officer of a transcontinental line: (1) and (2) All new equipment and all old equipment as it goes to the shop should be provided with air brakes. Automatic freight car couplers not yet sufficiently perfected. (3) Yes. (4) Yes, as to brakes.

R. D. Wade, Superintendent of Motive Power, Richmond & Danville: (1) Not less than 18 months after the passage of a law to this effect. (2) As new stock is acquired, and as cars go in for repairs. (3) Five years after the law goes into effect. (4) Yes.

A trunk line manager: (1) Six months from Jan. 1, 1890. (2) On new equipment, and 20 per cent. per annum on old. (3) Air brakes can be used when 20 per cent. of the train is equipped. (4) Westinghouse automatic freight brake; Janney coupler.

E. T. D. Myers, President, Richmond, Fredericksburg & Potomac: I doubt whether legislation would be wholesome or is necessary. The railroads will move in this direction with increasing rapidity, and the solution



of the problem can be safely left to them. The motives are strong enough without the aid of the law.

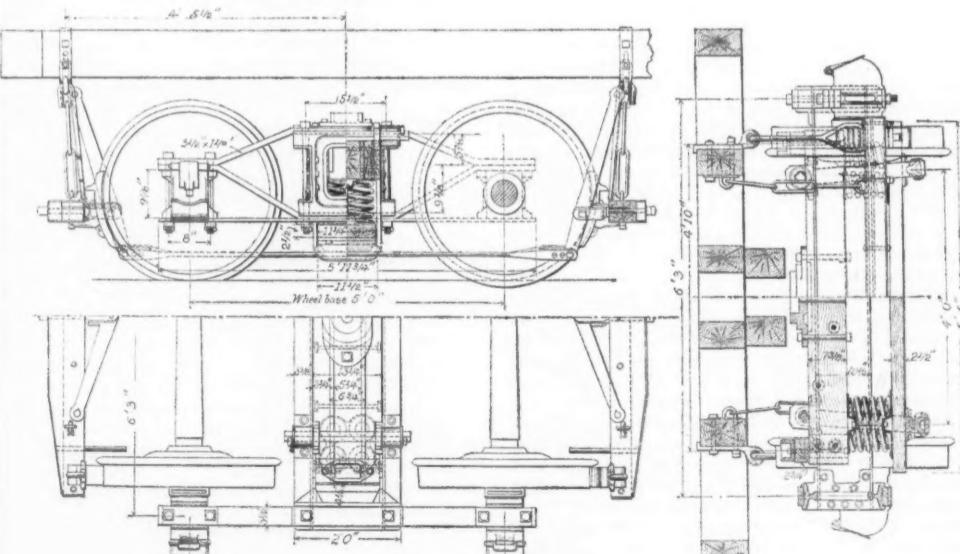
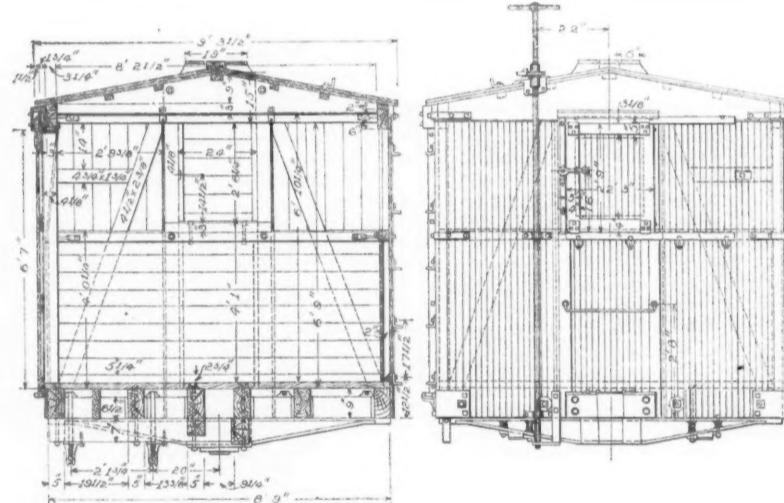
C. H. Hudson, General Manager, East Tennessee, Virginia & Georgia: The distribution of the enormous expenditure so as not to bankrupt many roads and oppress others will be very difficult. With many roads it would be possible within two years; there are others that could not do it without going into bankruptcy. (4) Yes.

Mr. Charles Paine, Vice-President and General Manager of the Philadelphia Co.: (1) Immediately. This is a prosperous time. (2) At least 20 per cent. of all cars owned, per annum. New cars not to go into service without both air brake and coupler. The safety of men and trains should be taken into account as well as the convenience of the companies. (4) Yes.

F. D. Casanave, Superintendent of Motive Power, Northwest system Pennsylvania Lines: Such a law requiring equipment of all cars built after the date of its passage would be practicable and not work very great hardship on the companies. To require their application to rolling stock already built would be disastrous to many. The application of these devices to new cars would make their use almost general in from 10 to 12 years, for the companies would extend the application to many old cars before the expiration of that period. The value of these devices for controlling trains would make the third requirement unnecessary. (4) Yes.

E. B. Wall, Superintendent Motive Power Pennsylvania Lines, Southwest system: A requirement that all cars built after the passage of the bill shall be equipped with automatic air brakes and M. C. B. couplers would meet the case. The adoption of these appliances would then be nearly universal in 10 years, as toward the end of that period any older cars would be equipped for the sake of uniformity, if for no other reason. Such a law would work no great hardship. The other considerations you mention should not be included in the law, as they would do great injustice to some of the roads who could not meet the expense. A law embodying the provisions I have suggested would be clear and concise, and there would be no opportunity for misunderstanding or conflict of opinion.

J. T. Harahan, General Manager, Chesapeake & Ohio: (1) I do not think that it should be made compulsory for railroads to apply the air-brake and automatic couplers to their freight equipment on any fixed date. Some of the lines could not afford it, and on others the local conditions surrounding their business are such that these appliances would not be applicable to their service. (2) Automatic couplers and air brakes should be applied to freight equipment as the cars are manufactured. There are a great many freight cars in service of a loading capacity not satisfactory to the present conditions of business and which in many cases are old, although not sufficiently worn out to warrant the cars being condemned. These it would not pay to equip with automatic couplers and air brakes, as in a few years they would be out of service. But as fast as cars of standard capacity are taken in for general re-



STANDARD 34-FT. BOX CAR, CAPACITY 50,000 LBS.

CHICAGO & NORTHWESTERN RAILWAY.

pairs, it might be well to apply the air brakes and automatic couplers to them; but the conditions of the service in which the cars are engaged would enter largely into the question of the advisability of equipping with these appliances any freight cars which are already in service. (3) It would not be practicable to fix a date upon which to require all railroads to have enough air-brake freight cars in each train to control the train. In the first place, the

back also; then an order to the second inferior to meet the superior, to be repeated back also; then an order to the superior directing it to meet the two inferiors at the points mentioned in the orders to the inferiors, and this must also be repeated back, making in all four (4) transmissions and four (4) repetitions. By the duplicate system an order would be sent to the superior and to one of the inferiors at the same time (one transmission) and would call for but two repetitions, and the same would be required with the order for the second inferior, making in all two (2) transmissions and (4) four repetitions. A greater saving of time in favor of the duplicate system appears where two or more inferior trains are ordered to meet a superior at the same point, in which case (supposing the inferior trains all received their orders at the same office) it would only be necessary to transmit the order once and repeat it back twice. This frequently occurs. By the single order system an order must be sent to each inferior train separately, and two orders to the superior, as shown above, and the loss of time is clearly with the single system.

In regard to the second objection, all of the cases quoted by the objectors which came to my knowledge had previously occurred on this division and were disposed of without difficulty or delay, and so clearly that the persons acting on the orders had no doubt of their meaning. I cannot imagine a case in practical train running which could not be readily covered by a duplicate order, although I have had 19 years' experience as dispatcher and five years intimate relations with dispatchers on a single track road which probably runs as near its full capacity as any one in the country; and a great variety of situations have occurred in the line of dispatching. If there are any such cases we have never found them, and until one is shown we shall doubt that there are any. Possibly it is not generally recognized that by the single order system, after the order to hold the superior train has been given, and the other orders given to the inferior trains to meet it, the dispatcher must take up the meeting points in all orders to the inferior trains, whether there are one or five, and embody them in another order to the superior train. It often occurs that no two of the inferiors are to meet the superior at the same point. In order to do this correctly he must have all the orders before him at the time of writing the order to the superior. If he overlooks one meeting point, or in his hurry to avoid delay trusts to his memory and makes an error in the meeting point, as has been the case in more than one instance, the outcome would probably be a collision. In other words, there is no check on the dispatcher in case from any cause he makes an error. The operator who receives the order for the superior train does not know what order the inferior train has, and vice versa. The only man who could discover an error would be the sending operator, but he must do it from memory if at all, and on a single order road where much business is done he would have no time to watch others.

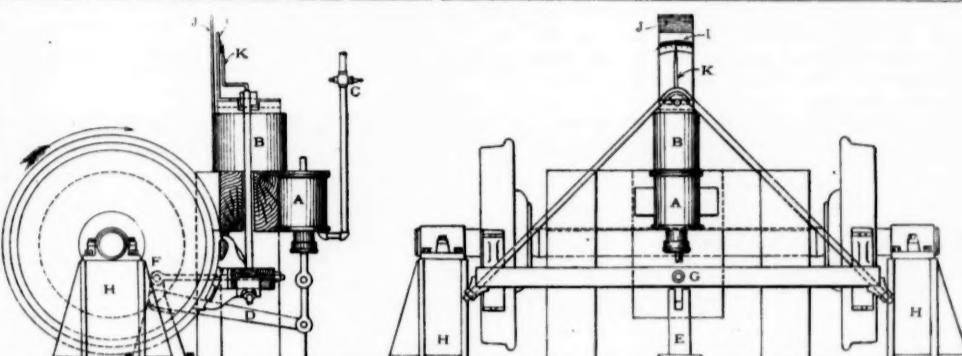
In the duplicate system the dispatcher addresses the order first to the superior and then to each inferior which is to meet the superior at any one point, and follows with the order, the whole being on one sheet, and each train affected by the order, whether rights are taken from or given to it, receives precisely the same wording. The order is sent to all offices at the same time, each operator who receives it, as well as the one who transmits it, watching to see that each repetition is correct. The meeting point being written but once by the dispatcher, he cannot make the error mentioned above. Such being the case, the trainmen have the utmost confidence in the system, and will take an extra passenger train over the road as quickly as they will take a time-table train having the absolute right of track.

Several years ago a large number of train dispatchers and those who had oversight of dispatchers on a certain system were brought together to discuss the merits of the duplicate and single order systems, with a view of deciding upon a uniform system for all the roads controlled by the management. Every man except the one duplicate man scarcely being allowed to explain the system. His statements were pooh-poohed by some, while others showed by their actions that he was doing them a personal injury by opposing their system. Others insisted that there were not enough hours in the day to send duplicate orders enough to move all the trains on their divisions. At an adjourned meeting the advocates of each system were instructed to present a diagram, showing the movement of all trains moved in an actual day's business, with copies of the orders issued on that day. The duplicate man was called on among the first. On displaying his diagram the single order men were amazed, and a number of them refused to display their diagrams. A resolution was then offered that the management be requested to adopt the duplicate order system, which was carried without a dissenting vote, 18 or 20 men being present. That system was adopted, and I know of none of those men who are not firm friends of it now. I know superintendents also whose views have undergone a radical change in favor of the duplicate system, but I do not feel at liberty to mention names.

The duplicate system is as safe as human agency can make it, not only for passengers and train men, but dispatchers also, and a road doing so much business that it cannot be worked by that system should be double tracked, for no other system could work it.

Mr. C. A. Goodnow, Superintendent of the Dubuque division of the Chicago, Milwaukee & St. Paul, and formerly dispatcher on the division of the Fitchburg which includes the Hoosac Tunnel, writes as follows:

I presume the severest test of any system to be that of keeping a number of work trains moving promptly and without delay to regular trains. On a division of the Chicago, Milwaukee & St. Paul work trains, consisting of steam shovel and pile-driver trains, have been kept at work the past season, requiring about 40 duplicate orders per day. It has frequently been necessary to run fast stock trains through the limits of these trains, and to work three and four work trains on the same limits. I cannot find an instance where dispatchers have failed to use the duplicate system to cover these complicated movements. I have never yet heard of an objection to the duplicate system by a dispatcher who had used it. On the contrary, I have heard dispatchers express their great relief that the system had been adopted. On certain divisions of one of the large Western roads where the adoption of the duplicate system was delayed (for reasons



SARGENT'S BRAKE SHOE TESTING MACHINE.

which did not reflect on the system), the dispatchers made repeated requests that it should be adopted.

Among the great advantages resulting from the use of the duplicate system are: 1. Prevention of lap orders. 2. Reduction of the number of train orders from 50 to 60 per cent. 3. As each movement, without regard to the number of trains affected, is complete in one order, the liability of dispatchers overlooking a transaction is reduced to a minimum. 4. There is great relief to a dispatcher from "carrying so much in his head."

If the claim of those who favor the single order system that the duplicate system cannot be used to meet some infrequent special movements was correct, it would not constitute a valid objection to the system. The fact that the duplicate system prevents lap orders ought to be sufficient to place it on every road in the country. Some of those who advocate single forms should furnish a few train movements which it is thought cannot be covered by a duplicate order for publication in the *Railroad Gazette*.

The New York, Lake Erie & Western adopted the duplicate system with the Standard Code early in 1888. Mr. E. Van Etten, who was then in charge of the Buffalo division of that road and has since been Division Superintendent on the Rome, Watertown & Ogdensburg says:

The Buffalo division comprised about 275 miles of track, about half single track, over which about 80 trains passed daily. The Western division of the Rome, Watertown & Ogdensburg comprises about 275 miles of single track, over which about 40 trains pass daily. The duplicate system has now been partially in force for about three months. When I assumed charge of this division two sets of dispatchers were giving orders on this division, cutting it in two, so far as orders were concerned. Now one set of dispatchers take charge of the whole division.

During the two years the duplicate system has been in use on the Buffalo Division, not once has it been found that trains could not be moved as rapidly as under the single order system. On roads where they do return at times to the single order system it is because the dispatchers have not been properly educated. Under the single system a dispatcher is allowed almost any latitude in wording the order, while under the duplicate system, as formulated by the Time Convention, he is restricted to the language as given in the forms, and without practice he finds it difficult to convey his various orders in the set forms. In the hurry to move trains in the case of blockades, etc., he returns to the old way, and then to shield himself claims it is impossible to do the business by duplicate system. With practice and an absolute adherence to the forms this trouble disappears. There is no difficulty about trainmen understanding the orders. If the duplicate system is not followed the trouble is entirely with the dispatcher. With very few exceptions every dispatcher on the New York, Lake Erie & Western was opposed to the duplicate system before it was adopted; but they are now, to the best of my knowledge, without exception, firm believers in its superiority. . . . Actual experiments have convinced me that a dispatcher can cover more territory by his use than can be done under the single order system.

Mr. W. H. Barrett, chief dispatcher of the "Nypano" division of the Erie at Galion, O., says:

On this division (sub-divided into third and fourth divisions) we have five passenger trains and about twenty freight trains each way daily on each subdivision. There are three dispatchers on each division, working eight hours each. The service requires an average of 75 orders per day on each division. The duplicate order system was adopted March 1, 1888. The present set of dispatchers handled the trains on this division for ten years previous to that time under the single order system, but now not one of them would on any consideration handle trains on single orders, so thoroughly are they converted to the duplicate system. After ten years' experience under both systems and on different roads, I have never run across a circumstance under which the duplicate order could not be adopted, neither have I ever heard of a dispatcher changing from the single to the duplicate orders who was not at once convinced that the latter was the only safe way to handle trains by telegraph. It lessens the work of a dispatcher one-half, and reduces the strain on his memory to a minimum.

Mr. W. M. Eggleston, Chief Dispatcher of the Jeffersonville, Madison & Indianapolis, at Louisville, says:

Average number of trains daily 35, length of time duplicate order system in use about 10 years. The fundamental principle of this system is for each person directly affected, to receive a duplicate of what all others interested have received, and I know of no instance during 17 years' experience with this system, where this principle could not be carried out. There are some orders issued that it is not necessary to issue to any one but the men in charge of the train for whose benefit such orders are issued, because no one else is interested or affected. In issuing such orders, no principle or rule of the duplicate system has been broken or violated, because no necessity exists for issuing duplicates to any one.

A dispatcher of 22 years' experience, the last eight

with the duplicate system, writes as below. He is of high reputation, but will not permit the use of his name:

. . . It took me some little time to work into the double order system, and until I did so I thought the single order was preferable in every way. After I became familiar with the duplicate I would not go back to single orders. Under the double order system a dispatcher requires to be more of an expert, and must be master of the situation at a glance. I am acquainted with men now acting as dispatchers under the single order who would never make a dispatcher under the double system, because they have not all the necessary qualifications for a first class dispatcher, although they do very well with the single order system. Under the single order the dispatcher secures the train having the right of way any distance from the meeting point, and then waits till it is time to send the order to the second train; but I have known cases where the dispatcher gave the second train the wrong meeting point, that is to say, a station beyond the one intended, and a collision was the result. This could not have happened with duplicate orders.

I have not, in my eight years' experience, found a case where duplicate orders would not cover any contingency that might arise, including accidents which blocked the track, etc. In all this time I have not sent an order that was not a duplicate order, and have found no cases where I thought the single order could have bettered matters or helped me in any way.

Mr. C. W. Fisher, dispatcher of the Norfolk & Western at Roanoke, Va., says:

Under some circumstances the orders have to be very long, and it takes quite a long time to get them out, but no longer than if the same number of points were to be covered by single orders, if as long. I have worked under the Missouri Pacific and the Chesapeake & Ohio systems and I have never found a dispatcher who was not in favor of the duplicate system.

Among others responding to our invitation was Mr. C. A. Darlton, Superintendent of Telegraph of the Richmond & Danville, a system which comprises 2,500 miles, organized in nine divisions and including a great variety of conditions. The duplicate system has been in use there three years. It is unnecessary, however, to add further testimony. On the main points the expressions are unanimous.

Brake Shoe Testing Machine.

The attention being devoted to brake shoe tests has called out several designs of machines for making such tests. The one shown here was designed by Mr. W. D. Sargent, of the Congdon Brake Shoe Co., for the purpose of testing the friction of two full-sized brake shoes at the same time, mounted in a manner similar to that in actual use on freight cars.

The device is described as follows: A is a steam cylinder into which steam is admitted to the lower side of the piston by a pipe leading from the valve C. This piston is connected by means of a link to the long arm D of a bell crank which is fastened to a fulcrum E, as shown. To the short arm of the bell crank at F is connected a rod running through a brake beam at G. On the ends of this brake beam are mounted brake shoes of the ordinary dimensions, i.e., 46 $\frac{1}{2}$ square inches. When steam is admitted to the cylinder the brake shoes are forced against the treads of two wheels mounted on the same axle, the axle being mounted on pillow blocks, as shown at H. The weight of the brake beam and the load produced by friction are carried by a spring in a spring case B.

When a load is applied to the brake beam the rotation of the wheels in the direction of the arrow causes a deflection of the springs in the case B, and a corresponding deflection of the plate I, which moves over a graduated scale on the plate J. It is thus that the amount of friction is indicated. If two brake shoes of unequal friction are used it is expected that the difference of friction will be recorded by the vibration of the pointer K working on a graduated arc on the plate I. This machine has not yet been erected, but the parts are nearly completed.

Notes on the Rio Grande Western.

The Rio Grande Western will be standard gauge from Ogden to Grand Junction, Colo., by Feb. 1. This line has been operated as a narrow gauge in connection with the Denver & Rio Grande system.

The rail used in the new work is 65 lb. per yard, made by the Illinois Steel Co. The angle bars are of iron, 38 in. long, six bolt holes. Oregon fir, Utah fir, and California redwood cross ties are used. The redwood ties cost about 61 cents delivered at Ogden, or 65 cents on

the ground. They will outlive a white oak tie if protected from being crushed by the base of the rail. To prevent this, a sufficient quantity of Servis tie plates were purchased to protect all the redwood ties put in. These tie plates also answer for rail braces on light curves. The Ajax rail brace is used on all heavy curves. The frogs used are No. 10 stiff rail, with 15-ft. split switches and revolving switch stands.

The line of the road has been greatly changed to avoid heavy curves and grades. Some heavy excavation and rock work was necessary, which was very expensive, because of the high price of labor. The heaviest grade between Grand Junction and Ogden is 216 ft. per mile. This is over the mountain at Soldier's Summit. The operation of this grade, including the care of snow sheds, is of course expensive.

Nearly all of the new standard gauge equipment has arrived. The passenger engines were built by the New York Locomotive Works, and have three pairs of drivers, coupled, and 18 x 24 in. cylinders. These engines are equipped with driver brakes and steam heating apparatus. The freight engines were built by the Baldwin Works. They are the consolidation type, with 20 x 24 in. cylinders. Part of the freight engines are equipped with driver brakes and part are not.

The freight equipment was built by the Wells & French Co., of Chicago, and the Litchfield Car & Machinery Co., of Litchfield, Ill. All the cars are 40,000 lbs. capacity. Half are equipped with the Janney automatic coupler and half with the Dowling coupler. All have the Westinghouse automatic quick-acting air brake; this and the Otis steel axle, Dunham door and Winslow roof make the cars first-class. The passenger equipment is certainly as fine as can be found on any of the Eastern roads. The coaches are 51 ft. 6 in. by 9 ft. 8 in. over all, are painted the standard dark red of the Rio Grande lines, a shade almost the same as the Pennsylvania lines. They are heated by steam from the engine. The Pintsch system is used for lighting. Each car has a ladies' toilet room, a gentlemen's toilet room and a gentleman's smoking compartment. No two cars are upholstered alike. The Johnson car seat is used with the improved roll head rest. The cars are finished in mahogany, and have large windows with double glass and curtains. The Paige 33-in. steel wheel is used, Miller platforms and couplers and vestibule hoods. Each car is supplied with a platform light. The entire passenger, mail, baggage and express equipment was built by the St. Charles Car Co., of St. Charles, Mo., and attracted considerable attention while in transit from that point to Salt Lake City.

The shops of the Rio Grande at Salt Lake are being enlarged and equipped with the latest machinery from the Niles Tool Works, Hamilton, O.; J. A. Fay & Co., Cincinnati; Bement, Miles & Co., Philadelphia, and others.

A number of the iron surface cattle guards have been put in. The Bud hand and push cars are used. In prosecuting the new work the tie-adzing machine and Emerson rail bender were used to great advantage. The adzer was run by a small Westinghouse engine supplied with steam from the locomotive which pushed the machine. The "blizzard" tail light will be used on passenger trains and as signal lights on the engines, and the Watts tail light on the cabooses.

The company is building its own cabooses in the Salt Lake shops. They are of the four-wheeled pattern, similar to those in use on the Pennsylvania. The improvements in station buildings and grounds and freight yards are being pushed to completion. The Salt Lake yard and shop tracks have been remodeled. A new 60-ft. turntable, built by Cofrode & Saylor, is being put in position at the Salt Lake roundhouse. A similar turntable is being placed at Pleasant Valley Junction. The road will be ballasted with stone and gravel, both of which are easily obtained.

Prior to the widening of the gauge, curves of 18, 20 and 22 degrees in the main track were numerous. In the new line eight degrees is the sharpest curve.

Since writing the above, the Mountain division of the road has been put into operation as a standard gauge. The big engines have come up to the expectations of the officers by hauling 16 loads over the mountain and doing excellent service with the passenger trains.

It is expected that a standard gauge road will be in operation between Denver and Ogden by about April 15, 1890. The route will be the Colorado Midland to Glenwood Springs, the Rio Grande & Junction from that point to Grand Junction, and the Rio Grande Western to Ogden. The Rio Grande & Junction is a new road, being built by the Colorado Midland and Denver & Rio Grande, and is owned jointly by them. In a quiet way there is being completed a new standard gauge road to the coast, which will enable the Burlington, Rock Island and possibly the Missouri Pacific to offer a through service to the public similar to that in operation over the Northwestern and the Union Pacific. It is generally understood here that this is to be the Pennsylvania's route to the Pacific coast, the C. & N. W. and the U. P. being a Vanderbilt connection, and the Santa Fe having made through arrangements with the B. & O.

SALT LAKE CITY, Dec. 20.

" DE.

New Railroad Construction for 1889.

The table given in this issue shows in detail the new main track built in the United States, Canada and Mexico in the year 1889, and is given with considerable

NEW RAILROAD CONSTRUCTION—JANUARY 1, 1889, TO DECEMBER 31, 1889.

NAME OF ROAD.	Track laid between Jan. 1 and Dec 31.			Projected for next season.		
	From.	To.	Miles	From.	To.	Miles.
Abbotsford & Northeastern	Abbotsford, Wis.	Athens, Wis.	15	Ada, Ala.	Troy, Ala.	26
Alabama Midland	Bainbridge, Ga.	Troy, Ala.	120	Ada, Ala.	Troy, Ala.	55
"	Ada, Ala.	End of track	12			
Montgomery, Tuscaloosa & North	Near Roper, N. C.	Panego, N. C.	14	Montgomery, Ala.	Tuscaloosa, Ala.	105
Albemarle & Panhandle	Ottawa, O.	Glandorf, O.	2.5	Panego, N. C.	Machet Pungo.	5
Alleghany & Kinzua	West Park,	Findlay, O.	1.5	Sugar Junction, Pa.	South	20
American Midland	Gedding's Sta., Md.	Annapolis, Md.	1	Glandorf, O.	Evansville, O.	12
Annapolis & Baltimore Short Line	Skipanon, Or.	Carnahanas.	6	Abilene, Tex.	Anson, Tex.	28
Anson & Abilene	"	"		Astoria, Or.	Skipanon.	5
Astoria & South Coast	Danville, Va.	Clarksville, Va.	47	Carnahanas.	Seaside H., Or.	7
"	Batesville & Brinkley:	Atlanta, Ga.	6	Clatsop Junction	Hillsboro, Or.	36
Athens & Jefferson	East Point, Ga.	Santee River, S. C.	3	Athens, Ga.	Jefferson, Ga.	18
Atlanta & West Point	Pinewood, S. C.	Williamston, N. C.	22			
Atlantic Coast Line	Bethel, N. C.	Greenville, S. C.	14			
Albemarle & Raleigh	Burnet, Tex.	Broad Cove, Md.	14			
Wilmingtn & Weldon	Easton, Md.					
Atlantic & Danville	Baltimore & Ohio—	Confluence, Pa.	20			
Au Sable & Northwestern	Baltimore & Ohio—	Manor Lands, Md.	20			
Austin & Northwestern	Baltimore & Ohio—	Penwood Park, Md.	0.8			
Baltimore & Eastern Shore	Baltimore & Ohio—	Lone Grove, Ark.	3			
Baltimore & Drum Point	Baltimore & Ohio—	Burtyv. Crossing, La.	6			
Baltimore & Ohio—	Batesville & Brinkley:	In Cumb'ld, Mt., Ky.	2			
Confidence & Oaklnd.	Baptist, Ala.	Jasper, Ala.	3	Jackson, Tenn.	Dyersburg, Tenn.	40
Baltimore & Sparrow's Point	Jamison City, Pa.	South	3			
Batesville & Brinkley:	Pamona Sta., N. J.	North	0.7			
Augusta & West Florida	Pinewood, Ark.	Grassy Bay, N. J.	10	Grassy Bay, N. J.	Brigantine Beach	3
Au Sable & Northwestern	Lyn, Ont.	Brockville, Ont.	5	Westport, Ont.	Palmer Rapids.	80
Austin & Northwestern				Brookfield, N. Y.	N. Brkfield, N. Y.	7
Baltimore & Ohio—						
Qu'Appelle, Long Lake & Saskatchewan	Lincoln Park, N. Y.	Charlotte, N. Y.	10.9			
Cape Breton	Battle C'k J., Mich.	Goshen June, Mich.	2.2			
Cape Fear & Cincinnati	London, Ont.	Windso'r, Ont.	112.5	Kemnay, Man.	Melita, Man.	58
Cape Fear & Yadkin Valley	Kemnay, Man.	Souris, Man.	17			
Cape Girardeau & Southwestern	Barnsley, Man.	Carman, Man.	6			
Carthage & Adirondack	Near Regina, N.W.T.	11th Mile Post	93	11th Mile Post	Prince Albert.	156
Cascade & Northern	Wilmington, N. C.	Parkersburg, N. C.	60	Point Tupper	No Sydney, N. B.	98
Central Belt Line	Williamsville, Mo.	Hunter, Mo.	23	Wilmington, N. C.	Greenville, S. C.	175
Central of Georgia	Oswegatchie, N. Y.	Bensen Mines, N. Y.	4.5	Parkersburg, N. C.	Fayetteville, N. C.	27
Savannah & Western	Palmer, Wash.	Durham, Wash.	5	Bensen	Big Tupper Lake.	30
Central of New Jersey:	Upato Creek, Ga.	Buena Vista, Ga.	26.5	Macon, Mo.	Bevier, Mo.	5 5
Kepport	Chattahoochee Riv.	Columbia, Ala.	1.03			
Atlantic Highlands	Sav. & West. Junc.	Pembroke, Ga.	15	Coulterville	Centralia, Ill.	44
Central (N. B.)				Salem, Ill.	Altamont, Ill.	45
"						
Centralia & Chester	Keyport, N. J.	Thorne's Creek, N.J.	2.56			
Central New England & Western	Lorillard Works	Hopping Junction.	3.91			
Charleston, Cincinnati & Chicago	Young's Cove Road	Cumberland Bay.	9.5			
Chattanooga Southern	Norton, N. B.	Chipman, N. B.	45			
Georgia State Line	Sparta, Ill.	Coulterville	8			
Chattanooga Union	Campbell Hall, N. Y.	Highlands, N. Y.	29			
Chattanooga & Virginia	Poughkeepsie, N.Y.	Silvernails, N. Y.	28			
Chesapeake & Ohio	Johnson City, Tenn.	Branham, Ga.	3			
"	Tinkers, Tenn.	Sherman Heights	1.5			
	Oak Hills, Tenn.	Thurmans	2			
Chicago, Burlington & Quincy—Burlington & Missouri River	Lake Village, N. H.	Alton Bay, N. H.	17	Kingston, Tenn.	Clinchport, Va.	131
"	Pittsfield, N. H.	Barnstead, N. H.	5	Clifton Forge, Va.	Warm Springs, Va.	22
Chicago, Kalamazoo & Saginaw	Tilton, N. H.	Belmont, N. H.	4		On Paint Creek,	
Chicago, Kansas City & Texas	C. & C. V. June	W. Davport, N. Y.	6		W. Va.	
Chicago & Northwestern					On Cabin Creek,	
"					W. Va.	8
Montrose, Ill.	N. Evanston, Ill.					
Chicago, Rock Island & Pacific—Chicago, Kansas & Nebraska	Pond Creek, I. T.	Near Ft. Reno, I. T.	75.2			
"	Dodge City, Kan.					
Chicago, St. Paul & Kansas City	Eden, Minn.	Wasioja, Minn.	4			
Chicago & West Michigan	Baldwin, Mich.	Manistee Riv., Mich.	28.8			
Choctaw Coal & Ry. Co.	Traverse City, Mich.	South	7.8	Traverse City	Manistee River.	38
Cincinnati, Alabama & Atlantic	So. McAlester, I. T.	La Fourche Maline, I. T.	39.6			
Cincinnati, Hamilton & Dayton	Cochsonton, O.	Zanesville, O.	30			
Cincinnati, Jackson & Mackinaw	End of track	Hamburg, Mo.	6			
Cincinnatti, Wheeling & N. York	St. Charles, Mo.	Sherrerdsville, O.	0.5			
Clay Springs & Apopka	Columbia, S. C.	Broad River, S. C.	1			
Clearfield & Jefferson	Columbus, Ga.	Richland, Ga.	39			
Cleveland, Akron & Columbus	Lake Village, N. H.	Alton Bay, N. H.	17			
Cleveland & Canton—Cochsonton & Southern	Pittsfield, N. H.	Barnstead, N. H.	5			
Cleveland, St. Louis & Kan. City	Tilton, N. H.	Belmont, N. H.	4			
Cleveland & Wheeling	C. & C. V. June	W. Davport, N. Y.	6			
Columbia, Newberry & Laurens	Mt. Gretna Narrow Gauge					
Columbus, Lima & Milwaukee	Covington Transfer					
Concord & Montreal	Craig Mineral					
"	Cumberland Ry. & Coal Co					
"	Cumberland Valley					
Darien Short Line	Bellefonte, Ga.	Walthourville, Ga.	10			
Dayton & Fairmont	Deadwood, S. D.	Lead City, S. D.	33			
Deadwood Central	Boonville, Tenn.	State Line	34			
Decatur, Chesapeake & N. Orleans	Phoenixville, Pa.	Falls of French Cr'k	7			
Delaware River & Lancaster	In Denison, Tex.	Colgate, I. T.	10			
Denison, Bonham & New Orleans	Lehigh, I. T.	Aberdeen Junction	4.5			
Denison Rapid Transit	Sapinero, Col.	Lake City, Col.	36.0			
Denver & Rio Grande	Glenwood, Col.	Rifle, Col.	26.4			
"	Forbes Junc., Col.	Victor Mines	7 3			
Denver, Texas & Ft. Worth	Branches.		6			
Detroit, Bay City & Alpena	Globe Run, Pa.	Wild Run, Pa.	4			
Detroit & St. Clair River	Dover, Ga.	Statesboro, Ga.	10			
Diamond Valley	Mitchell, P. Q.	Nicolet, P. Q.	21			
Dover & Statesboro	West Duluth, Minn.	Bay View Heights	3			
Drunmond County	End of track	Zumbrota, Minn.	9			
Duluth Incline	End of track	Grand Rapids, Mich.	50			
Duluth, Red Wing & Southern	Willard, Ky.	Webbville, Ky.	2			
Duluth & Winnipeg						
Eastern Kentucky						
East Tennessee, Virginia & Ga.—Briar, Blocton & Birmingham	Birmingham, Junc.	Savage Creek	19			
"	End of track					
Eau Claire, Miss. & L. Superior	Eau Claire, Miss. & L. Superior	Gurnee	12			
		Bessemer	22			
		Eau Claire, Wis.	30			
		Winona, Minn.	36			

confidence as being reasonably accurate, the information being nearly all directly from officers of the various companies. The columns showing lines projected and under construction are probably much less accurate, although this information also is nearly all official. The difficulty in making that part of the table comes from the fact that people allow themselves considerable latitude in reporting lines projected or under construction. The new mileage by states is as follows:

Alabama	157.53	North Dakota	18
Arkansas	65	Ohio	87.6
California	116.98	Oregon	13
Colorado	101.25	Pennsylvania	140.4
Connecticut	0.5	South Carolina	47
Florida	163.64	South Dakota	52.06
Georgia	315.5	Tennessee	195.4
Idaho Ter.	82	Texas	317.6
Illinois	160.5	Utah Ter.	63
Indiana	128.2	Virginia	237.5
Indian Ter.	204.1	Washington	360.1
Iowa	87.67	West Virginia	49.55
Kansas	55.2	Wisconsin	180.3
Kentucky	219	Total U. S.	5,300.00
Louisiana	133.5		
Maine	21.03		
Maryland	22.8		
Massachusetts	6.5		
Michigan	201.8		
Minnesota	162.27		
Mississippi	133		
Missouri	102.06		
Montana	81.5		
Nebraska	178.91		
New Jersey	82.97		
New Hampshire	16.7		
New York	171.48		
North Carolina	275		

The New Meeting Room of the American Society of Civil Engineers.

The house occupied by the American Society of Civil Engineers is an ordinary city residence, 25×55 ft. in plan, four stories high. The ground floor, on which the meetings are held, and which has hitherto been utilized as a library and reading room, was cut up into a broad hall, a parlor about 35 ft. long, and what was intended as a dining room, 17 ft. long, and the full width of the house. The space available for meetings was insufficient and inconvenient, and the only convenient method of ventilation, by the front windows, was noisy. It was thought desirable to have a new and more commodious house, which should also be fire-proof as affording greater security to the Society's library.

Mr. Wm. E. Worthen, while President of the Society, started a subscription for this purpose, and about \$8,000 was paid in when it was thought best on various accounts to postpone the erection of a new house for a short time; but the inconvenience from lack of room increasing with additional numbers, it was decided to build an addition to the rear of the house, knocking out the rear wall so as to throw the back room open to the addition. This has been done, giving a room with a net floor space of 47×23 ft., a part of which, as the rear wall of the building is carried on a single span girder so as not to disarrange the second story, is 11 ft. high, the lantern in the centre of the addition being 26 ft. above floor.

The sides and ceiling of the room are finished in ash and the floor is laid with hard pine. A gallery runs around the three sides of the addition, giving access to nearly 500 ft. of additional shelving, which is already nearly filled with books which had been kept on other floors. The room is lighted by day by four windows in the back end under the gallery and by about 140 sq. ft. of glass in the lantern, and at night by five groups of cluster lights and by single lights on the edge of the gallery, any or all of which can be turned down or out, from the floor, when maps or pictures are to be displayed by the aid of a stereopticon.

In addition to a fine fireplace of terra cotta and brick there are five registers in the floor, and a limited amount of ventilation can be given by the aid of valves near the extreme top of the lantern, while if more air is required 14 panes, 3½×2 ft., in the sides, can be swung open.

This addition, which has cost \$5,000, and will add greatly to the comfort and convenience of the members and their guests, will be used for the first time at the annual meeting.

THE SCRAP HEAP.

Notes.

Heavy floods in Arkansas, Missouri and the Southwest in the first week of the month caused considerable damage to railroads. Trains on several of the lines were suspended for two days.

In the annual message of Mayor Chapin, of Brooklyn, he recommends the building of another bridge across the East River.

A truss of the bridge erecting between Holyoke and South Hadley Falls, Mass., was blown down Jan. 5. One workman was killed and two injured.

Station at Winnipeg.

The hotel and station which the Northern Pacific & Manitoba is erecting at Winnipeg will be one of the finest structures in the city. The building has a frontage of 460 ft. on Water street, and 215 ft. on Main street. The general offices, three stories high, occupy 250 ft. on the Water street frontage, the balance being taken up with the hotel building proper. On the second floor of the general office building the depot, baggage, express, customs, despatchers', conductors', trainmasters' offices, and immigrants' waiting room are located. The remaining two stories will be used by the general officers and the clerks. The hotel building will be seven stories high, and contain 150 rooms. The building material used is Wisconsin red brick and Bayfield red stone. In the rear angle of the hotel and general offices the train shed now erected is located. The estimated cost of the building is \$400,000, but this amount may be exceeded. The hotel

NEW RAILROAD CONSTRUCTION—JANUARY 1, 1889, TO DECEMBER 31, 1889.—Continued.

NAME OF ROAD.	Track laid between Jan. 1 and Dec. 31.			Projected for next season.		
	From.	To.	Miles	From.	To.	Miles.
Elgin, Joliet & Eastern	Main line.	Quarries	1			
Gardner, Coal City & Northern	Coal City, Ill.	Coal mine	2.5	Rondout, Ill.	Waukegan, Ill.	6
Waukegan & Southwestern	Rondout, Ill.	Huth's Mills	30	Huth's Mills	New Canaan, N. B.	10
Elgin, Peotocadic & Havelock	Havelock, N. B.	Elkhart, Ind.	1.3	Elkhart	Mishawaka, Ind.	11
Elkhart & Western	Elkhart, Ind.	Carriage works	1	Ellensburg, W. Va.	Columbia River	10
Ellensburg & Northeastern						
Empire & Dublin	Hawkinsville, Ga.	Dublin, Ga	21			
Eutawville	Santee River	Sumpter, S. C.	33			
Evansville, Suburban & Newburgh	Evansville, Ind.	Newburgh	10.9	Newburgh	Rockport, Ind.	22
Evansville & Terre Haute	Old Pittsburgh Jct.	Old Pittsburgh, Ind.	4.1			
Evansville & Richmond	Elmora, Ind.	Sand Creek, Ind.	2.5	Sand Creek	Bethelton, Ind.	75
Fairhaven & Southern	Fairhaven, W.	Sedro, W.	27	Fairhaven, W.	Seattle, Wash.	50
Farmville & Powhatan	Jenning's Junc., Va.	Cumberland C. H.	44	Farmville, Va.	Brookneal	70
"	Farmville	Eastward	1.5			
Flint & Pere Marquette	East Saginaw, Mich.	Main line	8			
Flint & Northern						
Florida Central & Peninsula				Florence, Ala.	Linden, Tenn.	75
Florida Midland				Plant City, Fla.	Tampa, Fla.	225
Florida Midland & Georgia				Harper's Ferry, Fla.	Kissimmee, Fla.	11
Fort Payne Coal & Iron Co.				Valdosta, Fla.	Cedar Keys, Fla.	
Fort Worth & Rio Grande	Granbury, Tex.	Dublin, Tex.	50	Ft. Payne, Ala.	Coal mines	10
Genesis & Obed River	Genesis, Tenn.	South.	2	Dublin, Tex.	Comanche, Tex.	23
Georgia—				Pilot Mt., Tenn.	Deer Lodge, Tenn.	6
Union Point & White Plains	Union Point, Ga.	White Plains, Ga.	13			
Georgia Pacific	West Point, Miss.	Baird, Miss.	138			
Georgia South & Florida	Valdosta, Ga.	Palatka, Fla.	136			
Macon & Birmingham	Goodyear, Neillsville & Northern	Goodyear, Wis.	5	Macon, Ga.	Birmingham	220
Goodyear, Neillsville & Northern		Main track	3	Saddle Mound, Wis.	Clark County	12
Grafton & Upton	West Upton, Mass.	Hopedale, Mass.	6.5	Hopedale, Mass.	Millford, Mass.	1.5
Grand Tower & Cape Girardeau	E. C. Girardeau, Ill.	Grand Tower, Ill.	28			
Great Eastern	Bombay, N. Y.	Moira, N. Y.	9	Peterboro	Chemung, Ont.	9
Great Northern	St. Gregorie, Que.	Nicole, Que.	7			
Great Northwest Central	New Glasgow, P. Q.	North.	10	End of track	Montcalm, Que.	14
Greenfield and Northern	Brandon, Man.	Oak Lake	59	End of track	Toward Battler'd	10
Gulf & Ship Island					Stockton, Mo.	20
Hecla & Torch Lake						
Hereford						
Hornellsville & West Union	Columbia, La.	Mer Rouge, La.	58			
Houston, Central Ark. & Northern	Mer Rouge, La.	North.	11			
Huntington & Guyandotte River	Huntsville	Monte Sano, Ala.	3.5	Hornellsville, N. Y.	West Union, N. Y.	16
Huntington Belt Line	Hutchinson, Kan.	Kingman, Kan.	32	Mer Rouge, La.	Dermott, Ark.	137
Illawaco Ry. & Nav. Co.	Long Beach	Nahcotta, Wash.	12			
Indiana & Lake Michigan	South Bend, Ind.	St. Joseph, Mich.	40	Huntington, W. Va.	Logan C. H.	71
Indiansapolis, Decatur & Western						
Intercoceanic						
Irondale, Bancroft & Ottawa	Pueblo, Mex.	Perote, Mex.	89			
Jacksonson, Tampa & Key West						
Jacksonville, St. Aug. & Hal. R.	East Palatka, Fla.	Palatka, Fla.	0.5			
Jupiter & Lake Worth	Jupiter, Fla.	Lake Worth, Fla.	7.5			
Johnsonburg	Johnsonburg, Pa.	Claremont Junc., Pa.	19			
Jones Mountain	Hudson River, N. Y.	Becroft Mt., N. Y.	3			
Kanawha						
Kanona & Prattsburg	Kanona, N. Y.	Prattsburg, N. Y.	11.44	Fairfield, W. Va.	Mines	10
Kansas City & Smith & Southern	Neosho, Mo.	Prattsburg, Mo.	15	Prattsburg, N. Y.	Geneva, N. Y.	30
Kansas City, Memphis & Birming	Carbon Hill, Ala.	Mines	3	Prattsburg, N. Y.	South	78
Kansas City, Nevada & Ft. Smith	Horse Creek, Ala.	Mines	3			
Kansas City & Southern	No. Clinton, Mo.	Clinton, Mo.	2	Kansas City, Mo.	Monett, Mo.	170
Kansas City & Suburban Belt	Osceola, Mo.	Marschville, Mo.	1			
Kansas City, Watkins & Gulf	In Kansas City, Mo.	Broadway, K. C.	5			
Kansas City, Wyandotte & N. W.		Lake Charles, La.	5			
Keeserville, At. Saile Ch. & L. C'n	Summerfield, Kan.	Virginia, Neb.	20			
Kennebec Central	Port Kent.	Keeserville, N. Y.	5.6			
Kentucky Midland	Frankfort, Ky.	Randolph, Me.	40			
Kentucky Union	Ky. U. Junc.	Winchester, Ky.	6			
Kinbolton & Mansfield	Lexington, Ky.	Kentucky River, Ky.	31			
Kinderhook & Hudson						
Kingston & Pembroke	Knoxville, Tenn.	Cumberland Gap.	68.9			
Lake Erie, Essex & Detroit River	Gravel Pit	Leamington, Ont.	2			
Lancaster & Hanover	Gordon Creek	Kippewa Lake, Ont.	4			
Laney & Jackson Lumber Co.	C. & M. V. Junc., O.	Tarloton, O.	6			
Lehigh Valley	Laney, Ala.	Iron ore banks	2			
Loyalsock R. R.	In Allentown, Pa.		2.2			
Lexington Belt			3.7			
Livville Improvement Co.			3.5			
Long Island		Linville, N. C.	1.14			
Louisiana, Arkansas & Mo.	Louisiana, Ark. & N. S.	Delhi, La.	12			
Louisiana, North & South	Brenville, La.	Homer, La.	12			
Louisville, Cincinnati & Dayton	Mt. Vernon, Ill.	Jeffersonville, Ind.	65			
Louisville, Hardinsburg & Western	Irvington, Ky.	Fordsville, Ky.	42			
L'ville, New Albany & Chicago	Pineville, Ky.	Cumb. Gap, Ky.	15			
L'ville, New Orleans & Texas	In Indianapolis, Ind.	Ore Mines, Ala.	14.5			
"	Corydon, Ind.	King's Cove, Ind.	4			
"	Slaughter, La.	Bayou Sara, La.	16.5			
"	Cahoma, Miss.	Rosedale, Miss.	50			
"	Hampton, Miss.	Rolling Fork, Miss.	10.5			
"	Lawrenceburg, Ky.	Lexington, Ky.	24			
Louisville Southern	Rustburg, Va.	So. Boston, Va.	30			
Lynchburg & Durham	Fabyans, N. H.	Scotts Mills, N. H.	17.7	End of track	Durham, N. C.	74
Maine Central	Bear Creek, Mich.	Wessen City, Mich.	15			
Dexter & Piscataquis	Blue Ridge	Negro Creek, Tenn.	25			
Manistee & Northeastern	Marion, Kan.	Chingawassa, Kan.	8			
Manetta & N. Georgia						
Knoxville South						
Marion Bell & Chingawassa Spr.						
Maryland Central						
Deer Creek & Susquehanna						
Mary Lee Coal & R. R. Co.						
"						
Mason County Central	Shelton, Wash.	Southeast.	3			
Maxton, Alma & Rowland	Plainview, N. C.	Rowland, N. C.	2			
McKeesport & Bellevernon	Alma, N. C.	Maxton, N. C.	2			
Memphis & Atlantic	Elizabeth, Pa.	Bellevernon, Pa.	18.9			
Meridian, Waterbury & Con						
Mexican Central	End of track	Waterbury, Conn.	.5			
"	Salinas, Mex.	End of track	125			
Mexican Nat. Construction Co.	End of Track	West.	55			
"	Armeria, Mex.	Colima, Mex.	30			
Mexican Southern	End of track	Ojo Caliente	10			
Middleborough Belt	Middleburg, Fla.	Highland, Fla.	9			
Middletowns & Humbletown	Middletown, Pa.	Swatara Cave	3.5			
Middleville, Swainsboro & Red Bluff	Middleville, Ga.	Swatara, Ga.	20			
Milwaukee, D'ville & Northern	Hogan, Wis.	Lynn, Wis.	9.1			
Milwaukee, Menominee Falls & N	Lac du Flambe, Wis.</td					

will be ready for occupancy next fall. The general offices will be occupied shortly.

Breaking of Steam Pipes.

English manufacturers are having much trouble with breakage of steam pipes. One of the latest was at the Naval Construction and Armament Works, where six men were severely scalded. The pipe had been in use only three weeks. This is only one instance among many of a similar kind, and from the American point of view it is about time the English engineers changed the rules upon which they base the construction of steam pipes. In the United States little trouble is experienced from accidents of this kind, and this is probably largely due to the use of designs having a high factor of safety.

The Derocheuse.

The deepening and widening of the Suez Canal was a problem in some respects entirely novel. The soft, sandy or clayey parts of the bed were of course easily dealt with by ordinary dredging, but the hard rock met with near Chalouf was another matter, as dredging such a material was out of the question, and blasting could not be adopted as it would interrupt the traffic of the canal. Under these conditions the Suez Canal Company determined to try the method invented by Mr. Henry Lobnitz, of Renfrew, in which the rock is broken up by a series of stamps, fitted with cutting edges at their lower ends, and afterwards removed by dredging. In May, 1888, the Derocheuse, a machine constructed on these principles by Messrs. Lobnitz, was put to work on this rock, and the results obtained have been set forth in a recent paper by Mr. Frederick Lobnitz, published in the minutes of the Institution of Civil Engineers. The rock was from 5 ft. to 10 ft. thick, and a strip about 20 yards wide and 200 yards long had to be removed. The cutter stamps, each of which weighed 4 tons, and was allowed to fall 6 ft., rapidly broke up the rock into fragments ranging up to $1\frac{1}{2}$ tons in weight. Pieces of this weight, however, could not be removed by the dredger, and their removal by means of a crane and divers was found expensive, so it was determined to try if smaller fragments could not be secured by setting the cutters to work well from the face of the rock. This plan was successful, and the rock, being broken up into fragments easily dealt with by the dredger, 30 cubic yards of material were removed per hour. From the experience here gained Mr. Lobnitz states that the cost of removal by this system can be put down at 5s. per cubic yard. A curious fact is that the cutters are self-sharpening. This is secured by the steel of which they are made being soft outside and harder within. Blocks of 15 tons weight have been broken off by the machine.—*Engineering.*

Foreign Trade by Way of Montreal.

The Dominion Government has prepared a statement showing the quantities and values of United States and other foreign produce which found its way to Europe through Canadian territory last year, Montreal being the port of transhipment. Butter, cheese and lard are among the principal items, there having been 5,500,000 lbs. of American cheese and lard carried over Canadian railroads. Canned meats shipped to Europe reach the enormous total of 33,750,000 lbs. The total value of merchandise received from the United States and transhipped at Montreal last year was \$10,314,396. It 1888 it was \$8,058,888; in 1887, \$7,645,303, and in 1886, \$5,745,606.

Third-Class Passengers in India.

The South Mahretta Railway of India earned in the first half of 1889 51,338 rupees from first-class passengers and 73,267 rupees from third-class passengers. The revenue from third-class amounted to nearly four times as much per carriage as from first-class, and English stockholders are protesting against the "extravagant policy of the Indian railways in maintaining first-class carriages."

Velocity of Wind at the Top of Eiffel Tower.

At a recent meeting of the French Academy of Sciences a paper was read on the velocity of wind at the top of the Eiffel tower, by M. A. Angot. Three months' observations give a mean of 7.05 m. as compared with 2.24 m. at the Central Meteorological Office—21 m. from the ground. While at low stations there is minimum at sunrise and maximum at 1 p. m., the Eiffel-like mountains showed a minimum about 10 a. m. and a maximum at 11 p. m., while at midday there was but a slight upward bend of the curve.

Rope Carriage.

Two lines of ropeway for hauling cars containing minerals and goods are being constructed by London engineers for two different English mining companies. One line is $2\frac{1}{4}$ miles long, the other $3\frac{1}{4}$.

Foreclosures and Receiverships.

The *Railway Age* gives the following summary of foreclosure sales for 14 years:

No. roads.	Mileage.	Capital stock & bonded debt.
1876.....	30	3,810
1877.....	54	3,875
1878.....	48	3,906
1879.....	65	4,099
1880.....	31	3,775
1881.....	29	2,617
1882.....	16	867
1883.....	18	1,351
1884.....	15	710
1885.....	22	3,156
1886.....	45	7,087
1887.....	31	5,478
1888.....	19	1,506
1889.....	25	2,930
Total in 14 years.....	448	46,700
		\$2,682,740,000

The number of railroads which have gone into the hands of receivers gives a better indication of the general condition of railroad property during the year than do the foreclosures which are the fruit of previous years' sowing. In this respect 1889 compares favorably with its immediate predecessor, the number of roads for which receivers were appointed being exactly the same as in 1888 and the mileage and capital indicated being also almost equal. We find that during the year 22 companies, with 3,803 miles of lines and over \$184,000,000 of securities, have defaulted in their interest and have been placed in the charge of the courts.

The South Chicago Works of the Illinois Steel Co.

These works cover something like 100 acres of land, and besides them the company has works at North Chicago, Joliet, Milwaukee and Union. At the South Chicago works are four blast furnaces in operation, and four more will be in blast by the first of July next. The rail mills are turning out about 1,450 rails a day and the blast furnaces about 200 tons of pig iron each. The annual rail capacity is placed at 300,000 tons. About 2,150 men are now employed at the works. Six railroads enter the

NEW RAILROAD CONSTRUCTION—JANUARY 1, 1889, TO DECEMBER 31, 1889.—Continued.

NAME OF ROAD.	Track laid between Jan. 1 and Dec. 31.			Projected for next season.		
	From.	To.	Miles	From.	To.	Miles
Mount Pleasant & Sea View City, Napanee, Tamworth & Quebec.	Harrowsmith, Ont.	Yarker, Ont.	7	Charleston, S. C.	Seaview City	9
"	Tamworth, Ont.	Tweed, Ont.	29	"	"	"
Nashville, Chat. & St. Louis.	Dickson, Tenn.	Worley Furnace	7	Buffalo Val., Tenn.	Cookville, Tenn.	22
"	Gordonsville, Tenn.	Carthage, Tenn.	7	Lasen Co., 70th mile	123d mile, Cal.	33
Nashville & Knoxville.	Gordonsville, Tenn.	Buffalo Val., Tenn.	8	End of track	Ft. Jackson, La.	33
Nevada-California-Oregon.	New Orleans, La.	South	7	Vidalia, La.	Rayville, La.	75
N. O., Ft. Jackson & Grand Isle.	Vidalia, Ga.	Tensas, La.	25	"	"	"
N. O., Natchez & Ft. Scott	King's Hwy., L. I.	Race Track	5	"	"	"
New York & Seaboard	Drivers, Va.	Tarboro, N. C.	66	Hancock, N. Y.	Scranton, Pa.	54
New York & Western—Oneida, Carbonado & Scranton.	End of track	Sword's Creek, Va.	52	Ivanhoe Va.	South	16
Norfolk & Carolina—Clinch Valley Div.	Northern Maine.	Staples Mills, Minn.	33	Sword's Creek, Va.	Norton, Me.	59.5
"	Little Falls, Minn.	Leeds, N. Dak.	18	Mattawamkeag, M.	Houlton, Me.	71
"	Minnewaukan, Dak.	Butte, Mont.	70	Sappington, Mont.	Norris & Pony, M.	28
"	Gallatin, Mont.	Almira, Wash.	46	Boulder, Mont.	Elkhorn, Mont.	21
"	Davenport, Wash.	Port la Prairie, M.	43	Missoula, Mont.	Mullan, Idaho	149
"	Headingly, Man.	Morris, Man.	120	Almira, Wash.	San Couler, Was.	15
Northern Pacific.	Morristown, Minn.	Toward Brandon, M.	23	End of track	Brandon, Man.	25
Duluth, Crookston & Northern.	Middleton, N. S.	Crookston, Minn.	23	"	"	"
Nova Scotia Central.	Oak Grove, Ala.	Lunenburg, N. S.	70	"	"	"
Ohio & Mississippi—Cincinnati & Bedford.	Henderson, Ky.	Evansville, Ind.	10.5	Riverdale, Ind.	Reed's Sta., Ind.	11
Ohio Valley.	Monroe, Fla.	Sanford, Fla.	4	"	"	"
Orange Bl.	Greycourt, N. J.	Orange Junc., N. J.	13	"	"	"
Orange County.	"	"	"	Anacortes, W.	Sterling, W.	30
Oregon Improvement Co.	"	"	"	"	"	"
Seattle & Northern.	Palouse River.	Oaksdale, Wash.	37.1	"	"	"
Oregon Ry. & Navigation Co.—Oregon Railway Extension.	Tekos, Wash.	Mullan, Idaho Ter.	87	"	"	"
Washington & Idaho.	Rockford, Wash.	Spok. Falls, Wash.	27	"	"	"
Oregon & Washington Ter.	Fulton, Ore.	Pendleton, Ore.	7	"	"	"
Osceola & Lake Jessup.	Walla Walla, W.	Whetstone, W.	46	Walla Walla, W.	Union, W.	120
Ottawa & Gatineau Valley.	Owensboro, Ky.	Fordsville, Ky.	28	Osceola, Fla.	Oveido, Fla.	9
Owensboro Falls Rough & Gr. R.	Oxford Vil., N. S.	River John Vil.	47	Ironsides, P. Que.	Chester, P. Que.	30
Oxford & New Glasgow.	Pigwash Junc., N. S.	Pigwash Vil., N. S.	3	Fordeville, Ky.	Millwood, Ky.	22
Pacific Short Line—Nebraska & Western.	Pawnee, Ill.	Pawnee Junc., Ill.	5	South Sioux City.	O'Neil, Neb.	127
Pawnee.	Monarch.	New Haven, Pa.	5	"	"	"
Pennsylvania—	Mt. Pleasant, Pa.	Scottsdale, Pa.	5	Waverly, N. J.	New York Bay	6
"	"	South	6	End of track	Jack's Run.	2
Waverly & New York Bay.	Campbell Hall, N. Y.	Slatington, Pa.	93	Port Jervis, N. Y.	Tomhicken, Pa.	100
Ohio Connecting.	New Bloomfield, Pa.	Duncannon, Pa.	11	"	"	"
Pennsylvania, Lehigh & Eastern.	Rupert, Pa.	Bloomsburg, Pa.	1.8	Mt. Ephraim, N. J.	Spring Mills, N. J.	8
Penn., Poughkeepsie & Boston.	Gospport, Ind.	North Bedford, Ind.	4	Kalmig, Pa.	Clark's Valley	5
Perry County.	Vinton Sta.	Vinton Sta.	5	Phillips, Me.	Rangely, Me.	28
Philadelphia & Reading—Camden County.	Kakabeka Junc.	Kakabeka Junc.	15	"	"	"
Rupert & Bloomsburg.	Port William, Cnt.	Port Clinton, O.	2	No. Bedford, Ind.	Elliettsville, Ind.	4
Pittsburgh, Ft. Wayne & Chic.	Short Line Junc.	Port Clinton, O.	2	Vinton Sta.	Point Pleasant, O.	70
Indianapolis & Vincennes.	Montesano, Wash.	Dan River, N. C.	22	Fort Arthur, Ont.	Fort William.	6
Point Pleasant & Northwestern.	Ste. Anne, P. Que.	Glen Haven, N. Y.	3.8	Kakabeka Junc.	Sand Lake, Ont.	30
Port Arthur, Duluth & West.	N. Brunswick, N. J.	Landing, N. J.	5	Port Clinton, O.	Ottawa Co., O.	12
Port Clinton Short Line.	Montesano, Wash.	Redondo Beach, Cal.	20	Pt. Townsend, W.	South.	6
Port Townsend Southern.	Ste. Anne, P. Que.	Redondo Beach, Cal.	20	Pueblo, Col.	Silver Cliff.	70
Pueblo & Western.	Washington, N. J.	San Augustine, Tex.	5	"	"	"
Puget Sound & Gray's Harbor.	N. Brunswick, N. J.	Redondo Beach, Cal.	20	"	"	"
Quebec, Mont. & Charlevoix.	Sayreville Junc.	San Augustine, Tex.	5	"	"	"
Raritan River.	"	"	"	"	"	"
Ravenswood Spencer & G'ville.	Los Angeles, Cal.	Redondo Beach, Cal.	20	"	"	"
Red River, Sabine & Western.	Nacogdoches, Tex.	San Augustine, Tex.	5	"	"	"
Richmond, Edsburg & Potomac.	High Point, N. C.	Ashboro, N. C.	26	Yadkin River, N. C.	Wilkesboro, N. C.	30
Rich, Nic'sville, Irvine & Beatty.	Winston, N. C.	Yadkin River, N. C.	23	"	"	"
Rio Grande Junction.	Jarrett, N. C.	Valleytown, N. C.	7	"	"	"
Roanoke & Southern.	Nicholasville, Ky.	Richmond, Ky.	24	"	"	"
Rochester & Glen Haven.	Winston, N. C.	Dan River, N. C.	22	Richmond, Ky.	At Richmond, Va.	5
Rockaway Valley.	Rochester, N. Y.	Glen Haven, N. Y.	3.8	Rifle Creek, Col.	Beattyville, Ky.	58
Rockwood & Tennessee River.	N'w German'tn, N. J.	Peapack, N. J.	7.5	Dan River.	Grand Junc., Col.	63
Rumford Falls & Buckfield.	"	"	"	"	Martinsville, Va.	29
Rogers & Summit.	Rogers, Ga.	Stillmore, Ga.	32	"	"	"
St. Augustine & South Beach.	Augustine Vil., Fla.	South Beach, Fla.	3	"	"	"
St. Cloud Sugar Belt.	Narcossee, Fla.	Narcossee, Fla.	3.64	"	"	"
St. Joseph Valley.	St. Louis & Peoria.	Alhambra, Ill.	14	Berrien Springs.	Benton Har., Mich.	20
St. P., Alexandria, L. Ar. & Gulf.	St. Paul, Minneapolis & Manitoba.	Jennings, La.	14	Jennings, La.	Red River.	70
Salt Lake & Eastern.	Salt Lake & Eastern.	Grafton, Dak.	14	Grafton, Dak.	Cavalier.	16
Eagle Rock.	Johnson Junc.	Park City, Utah.	20	"	"	"
"	"	Cottonwood, Utah.	20	"	"	"
"	"	Wagner.	6	"	"	"
"	"	Red Butte.	7	"	"	"
"	"	Lockhart, Tex.	65	Houston, Tex.	East.	60
"	"	Rockdale, Tex.	50	End of Track.	Rockdale, Tex.	45
"	"	South.	25	Kenedy, Tex.	Laredo, Tex.	135
"	"	Foster, Cal.	26	"	"	"
San Gabriel Valley Rapid Transit.	Ukiah, Cal.	Oconee River.	45	Sandusky, O.	Columbus, O.	108
Santa Fe Southern.	Santa Rosa, Cal.	Oconee River.	5.4	Santa Fe, N. M.	San Pedro, N. M.	46
Savannah, Americus & Montgomery.	W. Alhambra, Cal.	Oconee River.	5.4	Bowman's, Pa.	Blackwood, Pa.	40
Schuykill & Lehigh Valley.	Abbeville, Ga.	Oconee River.	45	"	"	"
Scioto Valley.	Portsmouth Junc., O.	Oconee River.	45	"	"	"
Seaboard & Roanoke.	Anderson, N. C.	Neuse River, N. C.	7	"	"	"
Durham & Northern.	Falls City, W.	Snoqualmie Pass.	10	Chester, S. C.	Savannah River.	90
Georgia, Carol. & Northern.	End of track.	Davenport, W.	5	"	"	"
Seattle, Lake Shore & Eastern.	Near Soothomish, W.	North.	4	"	"	"
"	"	Albany, Col.	3.75	Interboundary.	Eureka, Col.	8
"	"	Garretson, Col.	96	Silverton, Col.	Bingham, Me.	7.5
"	"	Emden, Me.	3.5	Solon, Me.	Big Stone Gap, Va.	27
"	"	End of track.	21	Churchport, Va.	Clinch River.	18
"	"	Soth' Brunswick, Ga.	25	Waynesville, Ga.	"	"
"	"	Victoria, Tex.	55	Beeville, Tex.	"	"
"	"	Knight's Land, Cal.	9.7	Pacific Grove, Cal.	"	"
"	"	Paloma, Cal.	3.95	San, Margarita, Cal.	"	"
"	"	Montgomery, Cal.	4.43	Lake Majilla, Cal.	"	"
"	"	Newman, Cal.	1			

grounds, besides which there is wharfage room on the Calumet River. Nearly all of the ore is received by water, about 400,000 tons a year. Two hundred and forty tons can be unloaded from vessels an hour. A battery of 72 boilers is employed, heated by gas from the furnaces mainly, with oil as an auxiliary.

Bauereisen's Sentence Commuted.

Governor Fifer, of Illinois, has commuted the sentence of John A. Bauereisen, of Aurora, who was sentenced to the penitentiary in December, 1888, for two years, for conspiring to destroy the property of the Chicago, Burlington & Quincy by the use of dynamite, during the great strike on that road. Bauereisen was released on Jan. 2.

Beautifying Stations.

The Kansas City, Fort Scott & Memphis has employed a landscape gardener to arrange the grounds about the principal stations along the line of the road. Shrubbery and flowers are being set out artistically, and in the centre of each yard a star, the trade mark of the road, will be formed with foliage plants. This plan was started at two or three stations last summer and it will be carried out generally on the entire system.

Northwestern Lumber Production.

The Minneapolis newspapers report a falling off of the cut of lumber for the year from that of 1888. In 1888 it was 338,000,000 ft. and in 1889 it was 276,000,000. This, however, is a larger cut than any other year since 1885, while the cut of 1888 was the largest ever made.

The Strike on the Mackey System.

A conference was held Jan. 5 between President Mackey and a committee from the various roads comprising what is known as the Mackey system, and an agreement was arrived at under which the men returned to work. The strike arose from a demand of the men for the dismissal of a master of transportation, and involved firemen, freight conductors, and crews and switchmen. The freight business of the system was blocked for some days.

An Attempt to Abolish Grade Crossings.

A committee of leading citizens of New Brunswick, N. J., recently met President Roberts, of the Pennsylvania, in consultation over a plan for the abolition of grade crossings in that city. No satisfactory understanding seems to have been reached.

Station Buildings on the Erie.

The New York, Lake Erie & Western is erecting two new handsome stations, one at Delavan avenue, Buffalo, the other at Clifton, N. J. The latter station will supplant the one destroyed by fire last summer. The Delavan avenue station will be 72 ft. long and 31 ft. wide. The main building will be one story high, with awning, and will be surmounted by a three-story tower 60 ft. high. The building will be frame, with slate roof and cresting of terra cotta, and will contain a general waiting room, 24 x 24; ladies' room, 12 x 14; ticket office, 14 x 14; freight room, 17 x 28, besides two toilet rooms. The exterior will be of white pine, partly shingled; the interior of yellow pine with paneled ceiling. The windows will contain stained glass of many colors. The grounds are to be laid out in drives and flower beds. The cost of the building is estimated at \$5,000.

The Clifton station will be 54 ft. long and 26 ft. wide, and will be broken by several extensions. It will be one story high, surmounted by a ventilating cupola. The roof will be slate, with terra cotta cresting, and will contain a number of odd gables. The general design of the building is irregular, and it is perhaps the most artistic little station on the Eastern division. The general waiting room will be 19 x 26; ladies' room, 12 x 13; ticket office, 17 x 11; toilet room, 8 x 5; baggage room, 96 x 14. It will be built of the same material as the Delavan avenue station, both exterior and interior. The ceiling in the general waiting room will be decorated with a galvanized iron centre piece done in fancy colors. The cost is estimated at \$4,000. Both stations will be heated by furnaces in the cellar.

The station at Dunkirk, N. Y., is being remodeled. The shed over the tracks is being torn down, and in its place platform sheds will be erected. An awning will be built across the front of the station to cover the platform.

Three years ago the company adopted dark green with red trimmings as the standard color for station buildings. It has now been changed to buff with brown trimmings, and all the stations are being repainted.

By Rail to India.

Sir Edward Watkin, Director in at least nine English railroads and Chairman of four, including the Metropolitan and the Southeastern, has always been prolific in great schemes. The latest one which he has brought forward is for railroad communication from the north of Ireland to Calcutta. He proposes a tunnel, 10 or 11 miles long, between Scotland and Ireland, at the Mull of Cantire, Fair Head, County Antrim. The British Channel tunnel, of course, must be completed. Trains then are to run to Gibraltar, be transferred by ferry, thence to run along the northern coast of Africa, across Egypt and the Suez Canal, and skirt the Persian Gulf, and so on to Kurrachee, where the road would connect with the system of Indian railroads. By this means Ireland would be brought within 12 days' journey of India, and by means of a fleet of fast Atlantic steamers landing at Derry, New York would be but 17 days from India. This line may be completed before that by Behring Straits. The *Financial News* suggests that it is a pity that in the midst of Sir Edward's multiplicity of duties, both forced and voluntary, he has never had time to devise a scheme for getting a train from London Bridge to Cannon street in less than a quarter of an hour.

Duties of the Chief Engineer.

The Vice-President of the Union Pacific has just issued a general order defining the duties and jurisdiction of the Chief Engineer. It is as follows: From this date he will have on the entire system: 1. Charge of surveys and reconnaissances of all proposed new lines, and reports thereon. 2. Charge of construction of new lines, and of all structures and work pertaining thereto, including, except in special cases, the procurement of right of way. 3. Charge of the inspection of truss bridges and tunnels, and supervision of important repairs or renewals connected therewith, and the inspection of all structural iron in its manufacture. 4. The preparation of plans and specifications for, and construction of, all important special structures, such as shops, division terminals and depot buildings, for which special plans are required, and the preparation of all important yard plans. 5. The preparation and approval of standard plans for the maintenance and renewal of roadway, track and roadway material, buildings, bridges and all other structures. 6. The preparation and charge of right of way and lease

NEW RAILROAD CONSTRUCTION—JANUARY 1, 1889, TO DECEMBER 31, 1889.—Continued.

NAME OF ROAD.	Track laid between Jan. 1 and Dec. 31.			Projected for next season.		
	From.	To.	Miles	From.	To.	Miles.
Ultima Thule, Arkadie, & Miss.	Dulark, Ark.	Elers, Ark.	6	Bridgewater	New Berlin	20
Utica & Unadilla Valley	End of track	Salmon C'k, Wash.	6	Nr. Ottawa, Que.	35	
Vancouver, Klickitat & Yakima	Vaudreuil, Que.	Rigaud, Que.	16.5	Owensboro, Ky.	70	
Vaudreuil & Prescott	Vineennes, Oakland C. & Owensb.	Weatherford, Tex.	18	Mineral Wells	24	
Vineennes, Oakland C. & Owensb.	Western Counties	Digby, N. S.	24	Annapolis, N. S.	24	
Weatherford, Min. Spgs. & Northw.	Western Maryland—					
Baltimore & Harrisburg	Fairfield, Pa.	Highfield, Md.	11	Weston, W. Va.	Braxton, W. Va.	20
West & Ella River	Parsons, W. Va.	Elkins, W. Va.	21.8	West End, N. J.	Bergen Pt., N. J.	7
West Side Connecting	Pineville, W. Va.	Coke Ovens	.75			
West Virginia Central	Wheeling & Elm Grove	WHEELING, W. Va.		Wheeling, W. Va.	Elm Grove	2
West Va., Pineville & Tenn.	Williamsport & Binghamton	Williamsport, Pa.		Williamsport, Pa.	Dushore, Pa.	45
Williamsport & Binghamton	Williamsport & North Branch	Yreka		Apalachin, Pa.	South.	10
Williamsport & North Branch	Wilmington, N. C.	End of track	5	Nordmont, Pa.	Bernie, Pa.	17
Wilmington, Onslow & Eastern	Winona & Southwest	Bear Creek, Minn.	10	Halls, Pa.	Williamsport, Pa.	10
Winona & Southwest	Yadkin	Montague, Cal.	7.5	Salisbury, N. C.	Norwood, N. C.	46
Yadkin	Yreka	Yreka, Cal.	1	Yreka, Cal.	Etna, Cal.	35
Zanesville & Ohio River	Shawnee & Muskingum River	Rendville, O.	4.5			
Zealand Valley	Zealand Notch, Me.	Drakes, O.	1			
		End of track				

records; preparation and charge of mileage and distance records, of all main tracks, sidings, spurs, etc., of every description. Also records of track composition, ballast and tie charts. 7. The preparation and care of records of bridges, buildings and all other structures. 8. And such other work as may be assigned by the Vice-President, to whom he will report direct.

TECHNICAL

The Hall Signal Co.

On Jan. 4 the Hall Railway Signal Co., of Meriden, Conn., severed its relations with the Wharton Railroad Switch Co., of Philadelphia, except so far as manufacture goes, and on Jan. 7 the patents, contracts and business of the Hall Railway Signal Co. were transferred to the Hall Signal Co., of 50 Broadway, New York City. The latter company has acquired other valuable patents relating to signaling and will aim to cover the entire field of electric signaling, including not only block signaling but the protection of junctions and crossings, drawbridges and highway crossings. The officers of the new company are: President, William P. Hall; General Manager, Alvah W. Hall; Treasurer, Winfield S. Gilmore; Secretary, Melville P. Hall; General Agent, S. Marsh Young.

Hudson River Tunnel.

Messrs. S. Pierson & Son, the contractors for the completion of this work, are having a shield and other apparatus made by Messrs. Arrol, of Glasgow. It is expected that when the work is again fairly under way under the changed system, it will be carried on at a rate of at least 15 ft. per day, and that the two tunnels will be completed within a year.

Enameled Brick for Machine Shops.

A growing fashion in shop construction consists in lining walls in dark places with white enameled brick. This surface is so much superior to whitewash that it finds favor wherever tried. In Chicago where the black smoke soon ruins the reflecting power of white surfaces, it has been found to be almost the only desirable or durable surface to use. Whitewash or kalsomine cannot be cleaned, but must be done over when dirty, and eventually the coating becomes so thick that it scales off, while with the enameled brick the walls can be readily cleaned by simply wiping with cotton waste, and the coating lasts indefinitely. The interior courts of the latest buildings in Chicago are invariably finished in this manner and with the most satisfactory results. Some few machine shops in this country are finished with enameled brick, but it is not used to the extent that it might be with advantage. In England, where the days are so often gloomy and the value of a well lighted shop is highly appreciated, the walls are often lined with white enameled brick, and the saving in lights and the increased output of the workmen are considered to more than counterbalance the additional first cost.

Car Lighting.

The Chicago, Burlington & Quincy is experimenting with the Frost dry carburetor system for lighting cars. Four cars on the Kansas City run, and four cars on the suburban run to Aurora, have been equipped for a six months' trial.

Chignecto Ship Railway.

The works are now put on winter footing, the frosts closing up all surface working. The steam shovel will continue working at the dock basin at Fort Lawrence as well as at Tidnish during the winter. Excavation at the former point is sufficiently forward for masonry, which, however, will not be commenced till spring. The two cuttings at Tidnish end are about three-fourths done. One of them is 3,000 ft. long, the other 10,000 ft. They are 40 ft. deep. Work will be prosecuted on them during the winter. Morse's bog, which is being filled in with broken rock, is about half done. It is 4,000 ft. long and requires an embankment of 25 ft. Long Lake bog, a mile long, requiring an embankment of 15 ft., is about two-thirds done. Contracts have been made with A. Seaman, of Lower Cove, for 8,000 yds. of dimension stone and 2,000 yds. of broken stone, to be delivered next season, and with A. L. Gunn of Hantsport, N. S., for 2,000 yds. of cut stone. Other contracts are being made for stone; the entire works will take some 90,000 yds. Messrs. Dawson, Symmes & Ussher have contracted with Chappell Bros. of Tidnish, for four scows, and with James Purdy, of Sackville, for two, all of which have been commenced. They intend to construct at Port Elgin this winter a dredge capable of lifting 800 yds. of earth per day.

The Sprague Motor in Europe.

The Allgemeine-Elektricitäts-Gesellschaft, of Berlin, have secured the Sprague motor patents for Germany, Russia, Austria and some other countries, and are about to introduce the system for tramway traction on a short line between Florence and Fiesole, Italy. There are already upward of 500 miles of line, with 447 motor cars, worked on the Sprague system in the States, a fact which augurs well for its successor on this side of the Atlantic.—Engineering.

Leakage of Field Magnets.

Prof. H. S. Carhart, of the University of Michigan, Ann Arbor, has recently been experimenting with dynamos to determine the leakage of field magnets. The machines tested were one of the Mather type, capacity 500 watts, and a 5,000 watt Edison. The leakage of the first machine was due to four steel studs, supporting brass yokes forming the journals, and four iron bolts attaching the magnet to the wood base. The result of rectifying these errors was an apparent gain of 32.6 per cent., shown by calculating the lines through the armature in the two cases, though the real gain is not, of course, so great on account of the cumulative effect of increase of lines increasing the electromotive force, which in turn increases the ampere turns. The leakage in the Edison machine was between the poles and bedplates, which is filled in with zinc. Removing the cause by substituting a wooden base gave an increase of 6.25 per cent. This, the *Electrical World* remarks, is, of course, a capacity increase, not an efficiency one, and shows that a saving can be made in the material used in building, and that the requisite field can be obtained with a smaller expenditure of electrical energy.

Electric Brakes.

At one time electric brakes were regarded with a good deal of favor, and considerable expectations were formed as to their capabilities. The transport of energy by electricity is so rapid, and the conductors are so light and easily handled, that it seemed as if the quick action, which is the essential feature of a good brake, could be very easily secured by electrical means. So far these expectations have not been realized, and the matter has dropped out of public attention. Inventors, however, have still continued at the subject, and some advance has been made. The progress of the last four years has been tabulated by Messrs. E. Sartiaux and L. Weissensbruch in a paper read before the late Railway Congress in Paris.

It cannot be said that the paper affords much food for the hope that electrical brakes will come into vogue in the near future. Both the automatic air and vacuum brakes are so simple and efficient that there is little room left for the introduction of a new variety, unless it greatly exceeds them both in its braking power and also in economy of first cost. It would be greatly to be deplored if the present confusion, caused by the multiplication of types of brakes, were to be further aggravated; nothing but the most important advantages would justify such a proceeding.—Engineering.

Forced Draught.

Forced draught for steam boilers continually presents difficulties hard to overcome, and in marine service engineers are having their hands full to solve the problem of high speed of revolution of the engines and the use of light boilers supplied with air by forced draught. In this relation the following from *Engineering* is interesting: The Seagull, one of the new torpedo gunboats, which recently went to Portsmouth to undergo a progressive series of steam trials, has been ordered back to Chatham for the purpose of having her hull strengthened and stiffened, as the entire structure exhibited signs of weakness at the trial, which had to be abandoned at the end of two hours. The mean air pressure in the stokeholds was 2 1/2 in., the mean revolution 245, and the mean speed realized close upon 20 knots. The average horse power developed during the trial was 3,033, and, though this was considerably below her maximum, it was deemed inexpedient to press the engines further, as three out of the four boilers began to leak, while the vibration was very great, and nearly all the seams in the deck fluting opened out. When the vessel was previously tried at Chatham under natural draught, 2,700 horses and upward were easily obtained, the machinery worked well, and no vibration was set up.

Effect of Stress in Steel.

In a paper on the behavior of steel under mechanical stress by C. H. Carus-Wilson, read before the Physical Society (British), the following conclusions are reached: The effect of uniform longitudinal strain on a steel bar is threefold. (1) A strain of the molecules; (2) a strain of the elements; (3) a production of flow by the strain of the elements. The elongation due to flow is the strain usually observed, and this may be either recoverable or irrecoverable. The strain of an element is made up of a uniform dilatation and a uniform shear about an axis parallel to that of the bar, and therefore the flow elongation consists of an increase of volume together with a certain amount of sliding.

The author summed up as follows the general conclusions to which his experiments had led him:

1. Mechanical strain produces an atomic disturbance in a bar, and this disturbance increases regularly with the stress.
2. For small stresses the disturbance is only partly permanent, but as the yield point is approached it becomes wholly permanent.
3. The magnetic properties of a loaded bar are in general different from those of the same bar unloaded, but there is a certain stress, or range of stresses, over which the bar has the same magnetic properties, whether it be loaded or not.



Published Every Friday,
At 73 Broadway, New York.

EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Ad vertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

We have now received returns from the car-building companies, which enable us to make a somewhat accurate estimate of the condition of that industry in the year just passed. Reports from 36 companies give a total of 70,546 freight cars built. Last year we reported 71,719 built by 43 firms. Twenty-six firms, reporting in both years, built 57,000 cars in 1888 and 53,000 in 1889, but, taking all who have reported in either year, the average output per firm was 1,668 in 1888 and 1,960 in 1889. If complete reports were obtained for all of the private companies building cars, it seems probable that the output for 1889 would be even greater than it was in the preceding year. This result is quite different from that indicated by the incomplete figures available a week ago, when reports from half the companies showed a falling off of 20 per cent. Last October an examination of our car notes, published from week to week, showed considerably more orders placed in the four months ending Sept. 30, 1889, than in the same period in 1888, and from that record, as well as from other indications, we concluded that this business would be found to have been greater in 1889 than in 1888. The returns now appear to justify that conclusion.

In writing three months ago on the railroad building of the year, we said that a "new mileage for 1889 of 5,000 miles is not at all an unreasonable estimate." The elaborate table which appears in this issue shows a total of 5,302 miles of main line track built in the United States. Besides this we report 827 miles built in the British Possessions and 484 miles in Mexico. Although this is a smaller amount of new road than has been built in any one year since 1885, it is larger than there was reason to expect from the prospects early in the year. The average new mileage built in the United States, per annum, for the five years, 1885-1889, inclusive, has been about 7,500 miles; for the 12 years, 1878-1889, inclusive, it has been about 7,000 miles, so that it will be seen that the year's building has been really very small. Considering the increase of population, the constant expansion of settlement into sparsely-peopled territory, and the vast area yet thinly peopled, and practically without railroads, it would seem not unreasonable to expect that the yearly average should be at least kept up to that of the last 12 years for some years to come. Again, much of the new road built henceforth will naturally be in extension of existing systems, rather than in establishing new systems, and it is reasonable to expect that the average increase each year should be in some normal proportion to the amount of line existing at the beginning of the year. Looked at in this way, the amount of railroad built last year appears relatively even smaller than when

compared with the average of past years. For the 11 years, 1878-1888, inclusive, the increase each year was about 6.4 per cent. of the road existing at the beginning of the year. That was the average percentage of increase each year. At the beginning of 1889 there was about 158,000 miles of main line track in the United States, and 6.4 per cent. of that would have given us over 10,000 miles of new road for the year. It appears, therefore, reasonable to suppose that the additional mileage built in the last year is well within the requirements of the country, and that at least as much more may be built this year without any danger of overbuilding. The distribution of the new construction by states may be seen in another column. It will be noticed that the greatest amount built in any one state was in Washington—360 miles. It has been well known for a long time that the Southern states would build more than any other group of states. We find now that the Southern states east of the Mississippi have built 36 per cent. of the total; the Northern states east of the Mississippi, 24 per cent.; the Southwestern states, 18 per cent.; the Northwestern states, 10 per cent., and the Pacific coast states, 12 per cent. The striking characteristic of the year's building, that it was in short additions to existing lines, has been so frequently pointed out as not to require emphasis again. The new lines which promise to most seriously affect former traffic routes are the line connecting the Eastern coal fields with New England, by way of the Poughkeepsie Bridge; the Canadian Pacific's new line to Detroit and that of the Northern Pacific in Manitoba.

The Third Annual Report of the Interstate Commerce Commission is a thoroughly good piece of work. It covers the ground so well that any attempt to discuss it fully is out of the question. We can only comment briefly on a few of the things which it does and does not recommend. A condensation of it is given on another page. It wants passenger commissions prohibited, both for regular agents and for outsiders, and ticket brokerage abolished. This is thoroughly sound. It wants to see car-mileage payments regulated by law. This would probably be a good thing, but is not so simple as the preceding proposal, nor so much needed. It wants to have water routes subjected to the control of the Interstate Commerce act. This would be all right as far as it goes, but would hardly amount to so much as some people expect. It wants the relation between export and inland rates more clearly defined, and "respectfully submits" the subject to the "wisdom of Congress." We do not respect the wisdom of Congress, and are confident that if it attempted to define this particular subject it would define it badly. On the other hand, the Commission does not want to see, for the present at any rate, Federal legislation with regard to safety appliances. It believes that such legislation would do more harm than good. It is needless to say that we heartily endorse what it says on this subject. The conundrum, what to do about Canadian competition, the Commission gives up without trying to answer. So do we.

The duplicate order system of train dispatching, concerning which some interesting communications will be found on another page, is so manifestly superior to any other plan for general use that little argument is necessary to convince experienced operating officers who will intelligently and conscientiously examine the merits of the different methods. Where the single order system is still in use it seems to be because no careful investigation has been made. With dispatchers of the right temperament, who are careful and are not overworked, an inferior system may be used for years without causing a collision; and as many railroad officers judge their puddings wholly by the sensations of their palates, it is not so very strange that no progress is made. But the use of a wrong principle is never justified by the fact that skillful men can get along in spite of it. Ability to walk on eggs does not justify their universal use as paving stones. While it certainly is right to secure the best talent possible for the dispatcher's office, the present state of the railroad art and railroad management does not warrant the continuance of any dispatching system whose permanent safety depends upon always having the very highest ability, so long as there is a system equally good which makes much better provision against the possible occasional unqualified incumbent. Moreover, this proposition would still hold good even if the alternative system could be justly charged with some delays and inconvenience to trains. Dispatchers whose qualifications for their work are not so high as they should be are, unfortunately, still somewhat numerous. They should be educated up to the proper standard, whatever system is used; but

this does not affect the duty to adopt the best system. It is due to the men to do this, however expert they may be. One of the men whose views are given to-day says that he and his fellow-dispatcher on a short division adopted the duplicate system of their own accord three years before the company took action, making forms to suit themselves. Another correspondent says that some New England roads have "no system at all." Conductors ask for orders whenever they see a need for them, and the head office responds when it gets ready, and in forms nearly as numerous as the orders. This is the practice on some quite prominent roads. It is a pity that some of these enterprising dispatchers, who are progressive in spite of hindrances, and those roads which are unprogressive in spite of good examples all around them, cannot be brought together.

If those who are advising the use of a complete or even a considerable lining of fire-brick (not fire-brick arches) in the fire boxes of locomotives will look over the records of the past they will find there the results of a few experiments which may cool their ardor a little. One case which is rather amusing may be of interest to our readers. An Eastern road decided to experiment with a device which had for its novelty a complete fire box lining of considerable thickness. A locomotive was so equipped, and a fire started at the usual time to be ready for a train. When the hour for departure arrived there was not a pound of steam on the boiler, and yet the wood fire had been going for some time. After the use of considerable light combustible, steam began to appear and the locomotive was started for a run of 40 miles. From the start the boiler made steam almost uniformly. A decrease or an increase in the exhaust affected the steaming power but little, and when the end of the run was reached the locomotive went on making steam as if it were never going to stop, the safety valves blowing and the injector working. The roundhouse foreman did not dare to leave the engine by itself for fear of burning the crown sheet, and the crew were held until the fire-brick store-house of heat had exhausted itself and cooled down to a safe temperature. One may be sure that the easily-to-be-foreseen result decided the future policy of that particular road toward the device in question, and it is rather surprising to find advocates cropping out at this date when the effects of the heat retained in that most valuable device, the brick arch, are so well known to all who have tried to blow off and quickly wash out locomotive boilers, equipped with it, after a hard run. Worse even than the results mentioned in the foregoing would have been the difficulties experienced if the road upon which the device was tried had been one with long, heavy grades. Under such conditions the heat stored in the brick would have soon been exhausted, and the well-known low heat conductivity of fire-brick would have acted to prevent the access of heat of the fire to the furnace walls, and would thus have been an actual barrier to evaporation, and would have reduced the capacity of the boiler to furnish steam under a hard pull enormously, with a result of incapacitating the locomotive for long-continued heavy work. Fire-brick in locomotive fire boxes is a useful adjunct to assist in the continual ignition of the gases driven off from the fuel, and the location for such a purpose is well indicated by the present use of fire-brick arches. As a lining to cover up heating surface its presence is detrimental, and that theory which leads one to suppose that a locomotive fire box would be better if lined throughout with a coating of brick is a delusive one, and one that has been tried and found wanting in practical value.

Increase of Freight Train Loads.

In 1888 the average freight train load on the New York Central was 186 tons. In 1889 it had increased to 226 tons. This is a higher figure than that of the Pennsylvania. It is better than the New York Central has ever done before, and much better than it has done in recent years. Since 1882 the train load has never been as high as 200 tons, and has shown, on the whole, a downward tendency. In the years 1880, 1881 and 1882 train loads on the Central averaged 218 tons; but the through freight was greater than now, and the way freight much less. In those days through freight formed fully one-fifth of the whole tonnage; nowadays it is only one-eighth.

There was nothing in the character of the traffic in 1888-1889 to account for so sudden a change. The proportion of through freight was a little larger in 1889 but not very much. The average length of haul on all freight only increased from 180 miles to 184. The discrepancy between east and west-bound movement

was greater this year than last; and as far as this fact goes, it should have been more difficult to fully utilize train space. Nor does the description of freight show any radical alteration. Flour and grain have fallen from 2,600,000 tons to 2,300,000; live stock remains unchanged; provisions have increased. Coal has decreased from 4,300,000 tons to 3,800,000, but this is partly offset by an increase in lumber. Manufacturers have decreased, but the somewhat indefinite item of unclassified articles has increased almost correspondingly. These two changes are so great, and offset each other with such exactitude, that one wonders whether the Interstate Commerce Law has had the effect of encouraging a convenient indefiniteness in the description of shipments.

The simple fact is that the railroad has done substantially the same work with fewer trains. With a slight increase in ton-mileage (2,776,000,000 in 1889, against 2,755,000,000 in 1888), freight-train mileage has fallen from 14,740,000 to 12,383,000, or 17 per cent. This is an enormous change, and one which we should like to see more fully discussed than it has been. It is a long time since this has happened in anything like its present scale. To find a parallel we have to go back to the years 1874-75. The change from 1883 to 1884 was considerable, but it was not nearly so great as the one before us, and it was accompanied by a reduction in the volume of business which made it perfectly natural.

The increase in 1874-75 was chiefly due to changed conditions of engineering. The one now going on, if we may trust the figures before us, is due to increased utilization of car space. The average number of cars in freight trains is reported at the same figure for 1889 as for 1888. According to this showing, the difference in gross weight of the trains can have amounted to little more than the increase in paying load.

From one standpoint, this is a highly desirable result; from another, it is not so satisfactory. If the number of cars in each train was really the same in both years, the car mileage as well as the train mileage must have fallen 17 per cent. With the number of cars remaining the same, this result indicates diminished rapidity of car movement. When we remember how great has been the complaint of scarcity of cars, it would seem as though economy of train loads had been secured at the sacrifice of considerations of business policy. It is often a shortsighted measure to save money by reducing facilities. It may do very well for a year or two, but it works badly in the long run.

It is somewhat curious to see the relative change of base on the part of the New York Central and the Pennsylvania. In old days the Pennsylvania figured closely on economy in operation, while the Vanderbilt lines took the lead in sweeping efforts to develop traffic. What shall we say when we find the New York Central doing its old volume of business under better operating conditions, while the Pennsylvania builds new cars to attract trade from connecting lines, trusting that the bad economy in the use of its equipment will be more than made up by the business which such a policy can develop?

End Platforms for Freight Cars.

A man who stands in the first rank among those who have made railroads what they are to-day, and who can speak with the highest authority as to the value of many of the devices which most conduce to safety and economy in operation, writing concerning what we have lately said of brakes and couplers, says: "I have my own opinions, which coincide generally with what you say, but there is one thing I would like to call your attention to in connection with the use of couplers and brakes. The application of power brakes should be accompanied with the use of end platforms, with a hand-brake wheel at the end of the car, so that the [hand] brakes may be operated without the men being obliged to go on the top of the cars. Probably a very large part of the accidents to trainmen result from the necessity for their passage from one side of the train to the other, in the discharge of their ordinary duties while it is in motion; and the adoption of automatic brakes and couplers will not obviate this necessity. I write you on this point because I feel that there will not be as much decrease in the cases of death and injury to brakemen from the application of brakes and couplers as many people suppose."

We considered this matter of the end platform, but did not think it desirable that it should be included in any law that may be enacted, for two reasons:

First—The law should be reduced to the last degree of simplicity. The more it requires the more difficult will be its enforcement, the more burdensome will it be to the railroad companies, and the more formidable will be the administrative machinery. Therefore,

its provisions should be confined to two or three essentials.

Second—While there is substantial agreement among railroad officers on the questions of brakes and couplers, there is nothing like agreement on the use of the end platform. Some of the most intelligent mechanical officers are decidedly opposed to it. In fact, if a vote on the end platform were to be taken in the Master Car Builders' Association to-day there would probably be a great majority against it, unless there has been an unsuspected change of opinion in the last four or five years. In a very excellent report on this subject, made by a committee of the Association at the convention of 1885, the committee said "it is generally conceded that the time is not ripe for the Association to fix a definite standard for this portion of our freight cars." In 1886 the same committee reported no reason for changing this opinion, and said "the members of the Association entertain two diametrically opposite opinions, one in favor of, and the other opposed to, cars with end platforms." The whole subject then dropped. It is obvious that a law requiring the use of automatic brakes and couplers would have a strong public opinion behind it, among those upon whose support and co-operation its success would depend. A law requiring the use of end platforms on freight cars would have a decided preponderance of opinion against it. It seems, therefore, inexpedient to attempt to incorporate this latter feature in any bill that may be drawn.

It has been a matter of surprise that the end platform has not had more consideration as a safety appliance, and that its use has been confined to a few roads. The M. C. B. committee in 1885 found that it was largely used on but a few roads, the Pennsylvania, the lines of the Pennsylvania system and the Baltimore & Ohio having nine-tenths of all the cars reported as so equipped. A few other roads used it for a considerable part of their equipment, but reported against it.

The value of the platform simply as a means of safety cannot be doubted. It affords a safe way of passing from side to side of moving trains and a safe and convenient place from which to apply the brakes in yard work. It makes it easier and safer to get on and off from a moving car. It would ordinarily save a man who falls between the cars from falling to the track. Men getting on and off from cars in yard work would be less likely to be hit in passing buildings, cars or other objects alongside; and in passing bridges and tunnels the men could be safe and still use the brakes. Of course, all of these considerations will be of less importance as the use of automatic brakes and couplers extends, but even when these appliances are generally used many of the dangers of yard work will remain, and at best some years will elapse before most freight cars are provided with automatic appliances.

If there were any great business reason for not using the end platform it would be easy to understand the objection to it, but there seems to be no great business reason other than the natural hesitation to make an important change in design. The M. C. B. committee did not give any figures of comparative cost of construction and maintenance, but said generally that while cars with end platforms cost more to build, they cost less to maintain, and the differences in both elements were slight. There is an increased cost of the end platform car in the greater length of sills, truss rods and bolts, and in the addition of platform planks and sill caps; but there is greater facility in repair, in that a broken end sill can be replaced without disturbing the framing or covering of the car, and in that draft rigging can often be repaired without disturbing the contents of the car.

Other fine points of little importance have been made in discussing this matter, as for example that of the increased length of sidings required to take trains of cars with end platforms, but the conclusion that one is bound to reach is, we think, that there are substantial advantages in the end platform and no correspondingly important disadvantages.

Division Superintendents.

A division superintendent on a large road, an officer who has for co-laborers older and more experienced men (in charge of heavier divisions, where are the large city terminals), and, on the other hand, younger and possibly more brilliant men, who have been more recently placed on the newer divisions, where traffic is comparatively light, complains of both these classes, and some others, as follows:

In adopting the standard code, and in discussions concerning train rules before that code came up for consideration, I have been repeatedly surprised at the blundering way in which some of our superintendents,

train masters and dispatchers take hold of the subject. They do not seem to grasp the importance of uniformity at all, and strict discipline is far from being their hobby. On our busiest division, which is nearly all double track, the superintendent apparently takes little pains to dig into the intricate questions concerning rules for single-track movements, which are hard to explain to the trainmen, and his mind remains hazy on such points, unless some of the rest of us corner him and compel him to take up some question of this kind. And yet many of his trainmen have to run over single-track lines, and it is his duty to see that they fully understand the rules. Again, the superintendent of a division embracing a number of branches running but two or three trains a day seems to have overlooked the experience of years, and wants to continue the loose methods heretofore in vogue. He will take but little real, live interest in rule 108, because he expects apparently never to use it; he is not prepared to enforce the flagging rules, because he thinks it is just as well to allow the men some latitude, and so on. Our general superintendent is one who feels the necessity of following the highest and strictest standards in all matters connected with train movements, but these men do not catch his enthusiasm, and he, himself, is so much occupied with other affairs that he does not compel them to arouse themselves as they ought to do.

The burden of the complaint is that men of this sort lower the general standard of their profession and lead the higher officers to regard such a grade as the normal grade; this tends to make them unappreciative of more studious and painstaking men if they don't go farther and call them cranks; and thus faithful, ambitious and enterprising young men fail of promotion.

It is true that our friend has a real grievance here, and we wish we could tell him how to get it abated; but the owners of the road have cause for complaint just as real, and in a business sense perhaps of greater importance, for they have large interests at stake in the valuable property these men are set to manage, while each unappreciated officer has only his own fortunes to consider: and he has the privilege, any day, of turning butcher, or baker, or candle-stick maker, if he thinks he can better himself by so doing.

The division superintendent is an exceedingly important officer on a railroad. As most divisions are large enough to fully tax the energies of any one man, and very often exceed that limit, it follows that the assistant, who is generally the trainmaster, should be a pretty good superintendent also, so that the business shall not suffer during the enforced absences of the chief. (And "enforced absences" should include a liberal allowance for time to visit other divisions and other roads as well as for rest and for study.) Therefore these two officers should be of the very best quality obtainable. The general superintendent is charged by the directors and general manager with the conduct of an intricate business, and they generally seem to think that if this one officer is properly qualified, everything will run successfully. But they do not stop to think that the superintendent on getting his mountain of work together always finds it so large that when perched upon the top of the mountain himself—where he *must* be in order to even see what is to be done, let alone do it—he is quite unable to touch a single detail himself. His horizon is so large that merely to see that his subordinates are properly filling their places is all he can do on that side of himself; and his position between the immediate operating officers and the management above him gives him plenty to do on the other (upper) side. The real superintendent, then, is the division superintendent; and no greater mistake can be made than to assume that on a road large enough to be cut up into a half dozen divisions it is sufficient to provide *one* superintendent with brains and energy. There should be seven of them. And yet this is just what is done in very many cases; or at least that is a fair statement of the case if we look at the question as it shapes itself in the minds of the directors. If the division superintendents are really capable, it is because good men have been readily found by the general manager or superintendent, not because the directors have given any definite thought to the matter. In fact, they are better than the average of directors if they have given much thought to the selection of the general superintendent himself, beyond inquiring among others who give as little thought as themselves to matters of this kind concerning his general professional reputation.

A division superintendent needs to be saturated with train rules and the principles on which they are based, because he has not only to govern several hundred men according to a rigid code, but should also be an advocate; be prepared to argue points which men will not readily accept. Not even good rules can be crammed down the throat of the average trainman, at least not until you have used gentler methods long enough to get his confidence; and with things as they are it is

doubtless well that this is so. The division superintendent should be skillful in dealing with men in all sorts of affairs, because when compelled to refer all hard questions to his superior a large share of his own power is lost. He should be taken into consultation on topics that reach beyond his own division, because it is only by thus widening his range of thought that he can do the best work in the narrower sphere. In short, the division officer will be none too good if he has the privilege of constantly looking over the shoulder of his chief. We need hardly say that to get a body of men of the kind indicated it is necessary to begin early and never let the subject drop. The literature available for these men, concerning their distinctive duties, is not great, but it is not to be despised, and they should study what there is. The best time to study is in youth, so that the injunction to begin early has a specific as well as a general application.

Increase of Shop Tool Capacity.

In this growing country the visitor to railroad shops finds frequent complaints of lack of room and capacity for the work demanded. In most cases the work has grown out of all proportion to the shop capacity, and the floor space, which was originally more than sufficient, has become wholly inadequate. Owing to the large expense for new buildings, which, when made, must be built with a view to a largely increased amount of work in the future, such crowded shops are compelled for a long time to work under serious disadvantages, and wait for the increased capacity which would be brought about by new and modern buildings.

However, the acquirement of new shops is not the only, or necessarily the best, way that increased capacity is to be obtained. There is another plan which, if well and carefully followed, will, it is safe to say, increase the capacity of many shops, often 50 per cent., and in some cases, easily pointed out, 100 per cent., at a reasonable cost and without increased floor space. This may be done by an increase of tool capacity, which may be brought about by a critical examination of the method and the tools for doing each individual class of work, always keeping in mind the plan followed by other shops of recent construction, and particularly those which build work for cash profit.

For instance, in the matter of special bolts, screws and small fittings, almost any one can recall shops which are still using ordinary lathes for this purpose, and yet one good screw machine or turret head lathe would replace four of the ordinary lathes on that class of work, and give room for at least two new tools. In the case of car-wheel borers, the time saved by the new machines is almost as great as in the case of the tools just mentioned, and the difference between the quick return and the old-fashioned planers is too well understood to require further mention. In one railroad shop a large cold saw makes more details of frogs and switches, and cuts off more iron and steel satisfactorily square than four or five planers and slotters will be found doing in other shops. The mere mention of improved tool grinders will suffice to call to mind their possibilities as a means of increasing capacity. In cases such as these, one tool makes room for three or more others, and so on. The list is almost without end. It includes not only the iron-working tools, but more particularly those used for wood-working. In shops like those of our most progressive and best paying car manufacturing concerns, the work done per tool is often 100 per cent. greater than the average per tool in railroad shops, which are the subject of complaint by reason of lack of capacity. In the blacksmith shops and in the boiler shops, the special steam hammers properly equipped with dies, and the bending and forging machines, as well as the new-style flange punches, multiple drills and punches and flanging machinery, are in each individual case giving increased output, and are making room for the addition of a greater number of tools without increased floor space.

This plan, the increase of tool capacity, is being followed by some of the live western roads which have reached the point where they must do more work with less money and with a small allowance with which to purchase the necessary facilities. An increase of tool capacity might not be so advantageous if with it and in consequence of it there was found to be a larger amount of supervision and personal attention required from the superintendent; but the truth is to the contrary, the greater the capacity of the tools, the smaller their number and the closer their location up to the obstruction limit, the greater the ease with which the foreman can pass completely around the shops and the greater the number of visits which he can make to each tool in one day. A well equipped, carefully

arranged, small shop, with closely placed tools, is often, if not usually, more economical than a larger one of the same or greater nominal capacity.

Annual Report.

New York Central & Hudson River:

	Year ending,	
	Sept. 30, 1889.	Sept. 30, 1888.
Miles operated	1,412	1,421
Earnings, freight	\$21,010,514	\$21,334,299
" Passenger.....	10,944,902	10,878,119
Total, including miscellaneous	\$35,693,236	\$36,132,320
Operating expenses	23,710,544	24,626,338
Net earnings	11,985,393	11,506,582
First charges	7,868,061	7,891,463
Dividend	4,024,273	3,577,132
Surplus	93,358	97,987

The increase of dividend has been rendered possible by reductions in the operating expense. The course of traffic for the different quarters is somewhat curious. In the first quarter, ending Dec. 31, gross earnings showed a large decrease, and operating expenses a smaller one, making a decrease in net earnings. For each of the subsequent quarters net earnings show an increase, growing larger with each quarter. In the second quarter there was a decrease in earnings as compared with the previous year, and a larger decrease in expenses. In the third quarter there was an increase in earnings and a smaller increase in expenses. In the last quarter we find that most desirable of all results, an increase in earnings and a decrease in expenses.

Capital stock remains at \$89,428,300. Funded debt is \$57,183,333, an increase of \$1,000,000, on account of the purchase of the Niagara Bridge & Canandaigua. Construction account shows an increase in round numbers of only \$350,000 for the New York Central, and \$75,000 for the West Shore, other betterments having been charged to operating expenses. The charges for maintenance are nevertheless much smaller than the preceding year. Maintenance of way has fallen from \$5,450,200 to \$5,087,031. Repairs of equipment have fallen from \$4,867,248 to \$4,332,795. Transportation and general expenses only show the slight reduction from \$14,308,888 to 14,290,716, or much less than the reduction in transportation earnings.

Traffic statistics are as follows:

	1889.	1888.
Passengers carried	18,185,017	17,998,558
Passenger-miles.....	554,292,588	559,816,001
Tons carried	15,112,235	15,262,873
Ton miles	2,775,582,891	2,754,778,888
Train miles, passenger.....	9,575,014	10,015,709
" " freight	12,283,100	11,740,083
Average passenger train load.....	50	56
" freight train load.....	226	186
" length of freight haul.....	184	180

The most important points to be noted are the decreased train mileage and the increased train loads; the change in freight train load from 186 to 226 tons being specially noticeable. We have discussed the meaning of these figures elsewhere.

	1889.	1888.
	Cents.	Cents.
Earnings per ton mile	0.76	0.77
Expenses " "	0.56	0.59
Profit " "	0.20	0.18
Earnings per passenger-mile.....	1.90	1.91
Expenses " "	1.47	1.48
Profit " "	0.13	0.43

Those interested in railroad economy are curious to know the results of the increased attention lately given to securing proper firing of locomotives, and to learn particularly what are the results from the extensive circulation of printed instructions to firemen. Inquiry shows that, where the instructions to firemen, whether verbal or written, have been positive in their nature, exact, concise and free from generalities, they have produced excellent results. The success of the recent move on the Chicago, Burlington & Quincy toward a better and more economical use of fuel by means of proper instructions to firemen, not only by personal instructions in a firing school, but also by the circulation among the men of an admirable book on the subject by Mr. Baker, formerly traveling fireman and locomotive inspector, has been such as to increase the confidence of the officers in the continued success of the plan, and to show a decrease in fuel consumption per car mile in spite of the increased average load, and the employment of a large number of new and green men. The success of the premium plan carried out on some roads is also satisfactory, and there is much reason to believe that the proper instruction of firemen and the offering of coal premiums is now tending to and will in the future considerably reduce the total yearly coal consumption per ton mile.

Confirming what was said in a recent editorial on the changes in Northwestern traffic geography comes the statement that a large amount of corn is being taken from the Union Pacific by way of the "Omaha" to Minneapolis, and thence east by way of the "Soo" and the Canadian Pacific to New England points. Concerning this, the Chicago Tribune says that "if the Chicago-Council Bluffs lines do not wake up soon, they will find a large portion of their business gone when they begin to look for it." Doubtless they began to look for it some time ago, and realize now, if they never did before, that they must work out the settlement of their difficulties among themselves and without the aid of the government. There is one sentence in the report of the Interstate Commerce Com-

mission which is very significant in this connection. "What is called Canadian competition, therefore, is the common use by our own citizens of Canadian carriers for business that might be done by our own carriers, and induced solely by commercial considerations."

The trains on the Chicago, Burlington & Quincy, running chair cars out of Chicago, are giving great satisfaction and are meeting almost exactly the demands of passengers of the better class. The striking difference in comfort between these cars and those with ordinary seats is sufficient to fill them with passengers almost to the last seat before any considerable number will enter the others. It would seem that all reasonable attention has been paid to the comfort of the traveler in these designs. They have fine, large windows, and spacious parcel racks extending the whole length of the car on each side. They are heated by Baker heaters, have clean wash bowls, and excellent lavatories. They are equipped with the Scarritt reclining chair and Janney couplers; are mounted on trucks with good springs, and ride like good parlor cars. The additional cost which gives to the public such cars as these is not so great as to prevent a further increase in the number used.

One reads with interest the experiments made with small stationary engines, from 5 to 20 horse power, to determine the re-evaporation in the cylinder and the efficiency of steam jackets; but such experiments only indicate what may be expected in larger engines, and do not give data from which to make practical calculations relating to the class of engines in which we have the most interest. Most of the later records we now have regarding this matter are from tests of small engines. There is great need of an extended series of engine tests using large machines with instruments of such precision as to remove all necessity for rough estimation in drawing conclusions from the tests, which estimation is the weak point of most engine tests.

The Buffalo, Rochester & Pittsburgh has announced its intention to join the Buffalo Car Service Association. This, we believe, is the last one of the roads centering in Buffalo which had not taken this action. Notice has been given that on and after Feb. 1 there will be a minimum detention charge of \$1 per car per day for delays of over 48 hours. The Manager of the Association, Mr. Van Etten, is examining the operation of the associations in other cities preparatory to the beginning of the work of this association. It will be remembered that the Memphis Association also goes into operation Feb. 1.

An interesting paper, making an historical and critical examination of single eccentrics and radial valve gears, was lately read by J. R. Smith before the Hull Institution of Engineers and Naval Architects in England. It is accompanied by diagrams and illustrations. Those interested in such matters will find this paper reprinted in *Engineering*, Nov. 22.

NEW PUBLICATIONS.

The Evolution of Railroad Signaling. We have received the January number of the *Journal of the Franklin Institute*, containing a valuable lecture by Prof. C. Herschel Koyl on "the Evolution of Railroad Signaling." The lecture was delivered before the Franklin Institute, Nov. 25. It is adapted for a popular audience, but if it is somewhat elementary, it is therefore none the less valuable for railroad men. It is simple and lively in style, and illustrated with diagrams, and is easy reading, and many fundamental principles are laid down which should be familiar to all railroad officers; therefore, even those who can learn nothing from the paper, will not lose time in reading it.

The lecturer first explains the block system, and states in general terms its functions and principles, and the means of carrying it out. He holds the opinion that automatic block signals will eventually solve the question of expense in this branch of signaling. This may be true, but we are not at all confident that it is. Automatic apparatus is a valuable auxiliary to the block system, but in the present state of the art we should not feel warranted in depending upon it entirely, for many reasons.

Professor Koyl next takes up interlocking, and describes the method and uses of interlocking levers, and the various special contrivances, as selectors, facing point locks, detector bars and indicators. He concludes his lecture with a discussion of the form of signal. Every one will not agree with him in his ultimate and natural conclusion that there is now but one known signal that fills the ideal, but every one ought to agree with him in his definition of what a signal should be, viz.:

- 1. It should be distinct.
- 2. It should be distinctive.
- 3. Its changes should be marked.
- 4. Its day and night appearances should not be contradictory.

By "distinct" is understood that the engineman should find no difficulty in seeing the signal at any reasonable distance by day or by night. By "distinctive" is meant that it should be impossible, or nearly so, for the engineman to mistake the signal for any

other object along the track. By the third condition is meant that a glance should decide whether the signal is at 'danger' or at 'safety'; while the fourth condition, that the day and night appearances of the signal shall not be contradictory, needs no explanation."

Of course this signal must be an illuminated semaphore, and Professor Koyl holds that:

"It must be a semaphore, (1) changing position by day and by night; (2) changing color by day and by night, and giving us as a result a board always horizontal and red for 'danger,' always horizontal and green for 'caution,' always at an angle and white for 'all clear.'"

Directory to the Iron and Steel Works of the United States. Compiled and published by the American Iron and Steel Association. Tenth edition. Philadelphia: 1890. Price \$3, postage paid.

This work is now so well known as to require no particular description. It contains lists of blast furnaces, rolling mills, steel works, etc. In the lists of the mills and works an estimate of the capacity of each is given, and the arrangement is very convenient.

Copies of the Directory may be obtained by addressing Mr. James M. Swank, General Manager, No. 261 South Fourth street, Philadelphia, Pa.

A Text-Book on Roofs and Bridges, Part II. Graphic Statics. By Mansfield Merriman, Professor of Civil Engineering, Lehigh University, and Henry S. Jacoby, Instructor in Civil Engineering. New York, John Wiley & Sons, 1890. Price, \$2.50.

The publishers announce this work as to appear Jan. 10, and we postpone further notice of it until a later issue.

The Engineer (London) in its issue of Dec. 13 gives a very large and remarkably spirited and effective picture of the Forth Bridge. It is a wood engraving of a view taken from the northwest and gives the most impressive idea of the magnitude of the structure of any picture we have seen. The same issue contains an historical and descriptive account of the bridge, with diagrams of the early designs.

Third Annual Report of the Interstate Commerce Commission.

What follows is condensed from the above-mentioned report:

Organization.—Commissioners personally examine complaints, conduct trials and investigations, prepare reports and decisions, and carry on correspondence concerning duties of carriers. Secretary of Commission acts as executive officer and disbursing agent. Subordinate work is done in three divisions. The first has charge of clerical work connected with proceedings before the Commission. The second deals with rates and transportation. Its chief duty is the examination of tariffs, classifications and contracts. Since Dec. 1, 1888, it has received 180,000 tariffs for filing. The head of this division is termed the auditor. The third division is in charge of the statistician, and attends to the annual reports of the companies. The compilation of the returns for the year ending June 30, 1889, is now in progress, and the statistical report will be issued at an early date.

Investigations and Proceedings.—Seventy-three cases have been heard at Washington during the past year, and 38 at other places. There have been a large number of less formal investigations, and the chairman made an extended tour of enquiry as far west as the Pacific coast.

The first important investigation of the year related to the methods in use in the territory of the Southern Railway and Steamship Associations. The exceptions to the short-haul clause, the form of the tariffs and the conflicting classifications were found not to conform to the requirements of the act. Material improvement has since been made in these respects.

In May the Commission began investigating *free passes*. In spite of the law a great many have been given. Most of these are for use within state limits, chiefly to members of state legislatures. In some cases, not provided for by the act, free passes are justifiable; for instance, to persons injured in railroad accidents, or to employees of express and telegraph companies. Reduced rates might properly be allowed to the families of subordinate employees.

With respect to nearly all the other classes to whom free transportation has been given, it would seem clear that no justification can be found for their carriage under the provisions of the act. According to the returns made, the largest number of interstate passes issued of any class was designated "complimentary." Next in numbers were passes to steamship lines and transfer companies, United States, state and municipal officers, palace car companies, newspapers and for advertising.

Passenger commissions have done most serious harm, especially on long lines. Even where a \$1 maximum is fixed commissions sometimes are accumulative, as, for example, \$1 from New England points to Chicago, \$1 from Chicago to the Missouri River and \$1 from the Missouri River to Denver. In addition to these sums some roads may pay 10 per cent. commission on their earnings for a passage to a traveling passenger agent of, say, \$1.20, making a total for the sale of a single ticket \$4.20. In cases of commissions of only \$1 for short distances there may be no inducement for the agent to divide with the passenger; but in cases of cumulative commissions for long distances the temptation to divide is stronger, and the probability of abuse is so great that the impropriety of putting the opportunity before an agent is manifest.

Viewed in another aspect, the amount of money paid annually by the larger companies is vast. It is not unusual for a single company to pay a sum approaching \$100,000, or even more, in a year, and the aggregate undoubtedly reaches millions of dollars. This money is illegitimately spent; it is paid in excess of salaries to agents for the purpose of diverting business from competitors, and when competitors all do it, it is difficult to see how any benefit can accrue from it to any company. This practice has frequently been condemned by this Commission.

Car mileage is so irregular as to be a fruitful source of discrimination. The rates allowed for car mileage were shown to be as follows: For ordinary freight cars, a uniform rate of three-fourths of a cent a mile; for Pullman palace cars, three cents a mile; for Pullman palace tourist sleepers, one cent a mile; for ordinary passenger cars

exchanged with other companies, three cents a mile; for baggage, mail and express cars, exchanged with other companies, one and a half cents a mile by some roads and three cents a mile by others; for refrigerator cars used for carrying dressed beef, one cent a mile in some cases and in other cases three-fourths of a cent a mile; for furniture cars, oil-tank cars, palace live-stock cars, and other cars owned by private individuals and companies, three-fourths of a cent a mile. Some companies pay mileage on tank cars, both loaded and empty, and some only when loaded.

Roads west of Chicago had made five-year contracts with individual car owners, who were also shippers, to pay mileage at the rate of one cent a mile. The cost of the investment in cars and the amount of mileage allowed for their use show that the investment is very profitable. Refrigerator cars cost from \$800 to \$1,000; private cattle cars cost about \$650; oil-tank cars about \$610; cars used for the transportation of live hogs about \$500; ordinary freight cars from \$450 to \$500. Repairs to the cars are made by the railroad company in whose use they are when repaired, and of a refrigerator car eight years. At a car-mileage rate of one cent a mile the profit on the investment in many of these cars is very large, reaching, according to information acquired by the Commission, 25 per cent., 50 per cent., and even more, annually. Sometimes a car will pay for itself in two or three years. The evidence taken did not prove the payment of rebates to shippers by owners of any of these cars, but it was quite clear that some of the officers of railroad companies who were examined had impressions that such might be the fact.

The profits to these private car companies are shown by the report of the Pullman Company for the year ending July 31, 1888. The capital stock was reported at \$19,872,900; the gross earnings, exclusive of income from patents and other sources, at \$6,250,376.07; the net earnings at \$3,057,771.87, or 20 per cent. on the capital; and there was an accumulated surplus of \$12,552,393.

This presents a striking contrast to the profits of the railroads of the country as a whole, or even to the balance sheets of the best railroad properties. It is obvious that very reasonable profits would remain to the Pullman Company and a heavy drain upon the treasury of the railroads be averted by a material reduction in the mileage rates for these cars.

Besides, the use of these cars is an excuse for furnishing inferior passenger coaches by the roads. The traveling public are burdened with high rates for transportation in these cars, or subjected to inferior accommodations in ordinary coaches. If any portion of the public desires to pay higher rates for special accommodations, there can be no objection to their doing so, but the provision for the superior accommodations should not become a charge upon the general transportation.

Three-quarters of a cent a mile for freight cars is considered by the Commission ample—perhaps too high for railroads to pay outside shippers. Between different railroads the matter equalizes itself.

Free cartage may readily become a means of discrimination, because, when allowed, it is rarely mentioned in the tariffs. *Ticket brokerage* and *scalping* is recognized as an abuse of gross character.

Questions Decided.—Group rates have been declared legal. Rates on different branches of the same road, under dissimilar circumstances, may be different, but the company must be prepared to show that the circumstances are actually dissimilar. Shipments from points in the United States to points in Canada are subject to the law prohibiting rebates. It is lawful for carriers to fix a minimum car-load weight for cattle, and charge proportionate extra sums, by the hundred, for weights in excess of that minimum—in spite of the enforcement of a different rule by state commissions.

Statistics.—A summary is given of the statistician's report of last year (see *Railroad Gazette*, 1889, p. 542). The new mileage treated in the next statistical report will be about 6,000. Every month has shown a marked increase over the corresponding month of the year before. It is to be noted that with the exception, perhaps, of some coal roads, the increased earnings have been shared by the various groups or classes of roads in different portions of the country, and apparently in the following order: The Pacific Slope roads, the Trunk lines, the roads south of the Ohio and Potomac rivers, the southwestern roads, and in a less degree by those elsewhere. The Commission, therefore, believes that the effect of the law has been, on the whole, good for the railroads.

Government-Aided Railroad and Telegraph Lines.—An act was approved Aug. 7, 1888, applying to every railroad and telegraph company aided by subsidy from the United States in land or bonds. The general result reported by the Commission is that all of the subsidized railroad companies referred to in the act have failed to comply with the provision of the first section, that all of said companies should "forthwith and henceforth, by and through their own respective corporate officers and employees, maintain and operate, for railroad, governmental, commercial, and all other purposes, telegraph lines, and exercise by themselves alone all the telegraph franchises conferred upon them and obligations assumed by them under the acts making the grants;" and all except two companies have failed to comply at all, and those two literally, with the provision in the sixth section requiring said companies to make annual reports to the Interstate Commerce Commission. It is proper to state that the Union Pacific Railway Company reports to this Commission immediately after the passage of the act of August 7, 1888, it attempted to assume direct control over its telegraph line, and to comply with the provisions of the act, but was prevented from so doing by an injunction granted by the United States Circuit Court.

Conference of Railroad Commissioners.—This was rendered necessary by the difficulties of defining State and Federal jurisdiction, and the lack of harmony in the form of returns required and in their time for presentation.

Accounts of the work of this conference were given in the *Railroad Gazette*, 1889, pp. 159, 162.

The chief subjects treated were uniform railway statistics, uniform classifications, harmony in legislation and safety appliances.

Long and Short-Haul Clause.—The general rule indicated by the fourth section of the act to regulate commerce, usually known as the "long and short haul" clause, at the outset of its administration engaged the serious consideration of the Commission. Its importance and value to the public, as well as to the transportation interests of the country, were manifest. A few exceptions, such as were evidently contemplated by its provisions, were then recognized and announced by the Commission. The practical experience of considerably more than two years has not demonstrated the necessity of adding to these exceptions. The justice of the principle involved in the general rule has never admitted of serious question; the justice of the principles on which the exceptions are based is equally apparent.

While it is true that there yet remain many instances in which the existing exceptional difficulties can and must be further overcome by carriers in the direction of a nearer compliance with the fourth section, yet it is also true that since our last annual report very considerable progress has been made by them on this line. The business of localities, no less than of the carriers, is growing to the law, and all this strengthens its operation and administration. Results for the better are, upon the whole, everywhere reached in the transportation rates and methods of carriers.

Uniform Classification.—The results are not equal during this period to what the indications then existing led us to expect might be accomplished at the time of the presentation to Congress of our second annual report. At that time a call had been issued by a conference consisting of representatives from each of the leading traffic associations of the country, dated Nov. 15, 1888. In that conference it had been agreed that this call should be made for a meeting on Dec. 4, 1888. Delegates from each of these associations were appointed to that meeting, and there were eight of these traffic associations. The attendance was of a character to fairly entitle the conference to be considered national in its representation. The Pacific, the South, the West, the Middle, the East and the New England states had representation.

A standing committee, composed of two members from each of the traffic associations, was appointed for the purpose of unifying as rapidly as possible the several classifications in use. It met in Chicago Feb. 5, 1889. After three days spent in discussion, the committee agreed upon rules and regulations necessarily preceding a classification, and the remaining time was spent in discussing questions of classification. The committee, however, divided upon the question of representation as between the West and the East, the Western representatives claiming that they did not have sufficient representation. After this, and when the committee met in New York in June, 1889, the four delegates from the Texas and Transcontinental associations and from the Trans-Missouri Association had withdrawn. The work was continued without them, but has been of a rather irregular kind.

A work of this character and importance, in view of the provisions of the act to regulate commerce and the general interests of the country, should be made the subject of more than a few days' meetings at long intervals from time to time during the course of a year.

The Commission believes that state legislation could not prevent the use of a uniform classification if the railroads would agree upon it. Considerable progress has been made practically on the line of uniform classification into those of the three chief classifications of the country, namely, the Official, the Western and the Southern Railway and Steamship Association, as will appear by Appendix 7, made part of this report.

Canadian Competition.—It is estimated that fully one-third of the through business of the Canadian Pacific to and from the Pacific coast consists of traffic furnished from the United States. The west-bound business going over the Canadian lines originates at various places in the New England and Middle States, and at the Northwest. These lines therefore compete for traffic moving in both directions across the continent, or across sections of it. The competition is consequently with all our east and west bound lines, both the transcontinental and trunk lines and in nearly all the varieties of traffic.

The explanation for the diversion of such a considerable amount of traffic from our lines to the Canadian carriers is found in the rates charged. Our own lines, it may be assumed, make their competitive rates as low as they can afford to do the business at any fair profit, and not having unrestricted liberty to charge less for a longer than for a shorter distance over the same line and in the same direction, to make good, if necessary, any loss on long-haul traffic by higher charges on local traffic, their rates must be adjusted to make some profit on all traffic, and be graduated to comply with the law.

A natural inquiry arising on these facts is how the Canadian roads can afford to carry at so much lower rates than American lines, and why the rates for both are not uniform. There are various answers to this inquiry. In the first place, they must in general carry at lower rates in order to participate in the carriage of American traffic. The differentials consented to by traffic arrangements to preserve amicable relations and to maintain steadiness of rates have been mentioned. The lower rates are therefore, first of all, a necessity of the situation.

Again, the American roads are many in number, keenly competing among themselves, and dividing the business which, particularly west of Chicago, might be reasonably remunerative for one-half or one-third the number; and, therefore, in order to maintain their existence, are compelled to charge rates that might be lower and yield a profit to the carrier if the volume of business were greater, or equal to the capacity of the road. The American roads are also under many different, independent and sometimes hostile managements, increasing the expense of general control.

On the other hand, the Canadian lines enjoy unity of control to a much greater extent. Besides, they are heavily subsidized by direct government grants and favored by liberal allowances for transportation. They are practically under no restrictions imposed by their own statutes in respect to long and short haul traffic, but are at liberty to charge high rates on local business to indemnify for losses on through or international business. Their managers deny with more or less emphasis that their local traffic is subjected to higher rates, but when the liberty to make such charges and the necessity co-exist, the inducement at least is strong. The provisions of the Canadian statute on this subject are as follows:

SEC. 232. The company, in fixing or regulating the tolls to be demanded and taken for the transportation of goods, shall, except in respect to through traffic to or from the United States, adopt and conform to any uniform classification of freight which the governor in council on the report of the minister, from time to time, prescribes.

SEC. 232. No company, in fixing any toll or rate, shall, under like conditions and circumstances, make any unjust or partial discrimination between different localities; but no discrimination between localities, which by reason of competition by water or railway, it is necessary to make to secure traffic, shall be deemed to be unjust or partial.

These enactments give all traffic carried in competition with our carriers unlimited freedom.

The Commission contents itself with presenting the facts, and makes no recommendation.

Report rates.—The Commission has found it rather difficult to apply a uniform rule. The case of Boston is somewhat different from that of New York; the case of the Southern ports may prove still more difficult. If the statute should expressly provide that the published tariff rate from interior points to sea-ports must be the same whether the property transported is for local delivery at such sea-port or for

the purposes of export from such sea-port, leaving the rates from such port to the foreign destination to be such as the unrestrained competition of vessels might settle, then there would be no more difficulty in regulating inland transportation of property to a seaport for the purposes of export than there would be in the case of domestic traffic. The difficulty in its regulation under the statute at present arises in cases where a through rate is charged from the interior point of shipment through the port of transshipment to the foreign market, made sometimes as a gross through rate, but most usually as a through rate in which the inland rate is added to the prevailing ocean rate. In either event, as the ocean rates daily and often hourly fluctuate in the competitive strife of vessels, and are subject to no regulation whatever, the inland or rail proportion of the through rate has no fixed stability, but fluctuates with the ocean rates, and by manipulation of the vessel rates a margin may be created for preferential rates and secret arrangements for the benefit of individuals or of traffic by which the law can easily be violated without detection. At the port of New York the Commission met this, as far as possible, by requiring that inland rates of rail carriers to that port should be the same on traffic for export as on that intended for local consignment there. And at New York, as well as other ports, the Commission met this, as far as possible, by requiring the published tariffs of the rail carriers to show the proportion of the through rate from the interior points of shipment to the port of transshipment. But as remedies these are not sufficient to adequately check the evils we have enumerated.

Carriers not Subject to Control.—This includes not merely water routes, but railroads within the limits of a single state. The want of harmony between state and national laws is a serious matter. The bringing about of that harmony by a substantial re-enactment of the act to regulate commerce by all the states and territories would to a large extent relieve the whole subject of the difficulties at present attending it, and would go very far towards a solution of the railroad problem. Possibly such a re-enactment may in time occur.

Consolidation.—The effect of the law in this direction is certainly not so great as has been supposed. The following figures are interesting:

CONSOLIDATIONS, ETC., TO DECEMBER 31, 1888, OF ROADS THAT WERE OPERATING COMPANIES ON JUNE 30, 1880.

How acquired.	1880	1881	1882	1883	1884	1885	1886	1887	1888
Consolidated, absorbed and merged	33	53	11	9	7	5	9	9	7
Controlled, leased and operated	69	28	40	22	12	23	12	15	21
Purchased	13	8	3	5	1	2	2	2	4
Total	115	89	54	36	20	30	23	26	32
Reorganizations and changes in name	7	7	4	3	5	5	12	11	3

Recapitulation.

Total for nine years	425
Average per year	47
Total for seven years preceding 1887	367
Average per year	52
Total for two years (1887 and 1888)	58
Average per year	29

Safety Appliances.—The figures of accidents reported to the Commission are as follows:

Passengers killed	315
Passengers injured	2,138
Employés killed	2,070
Employés injured	20,148
Other persons killed	2,897
Other persons injured	3,602
Total persons killed	5,282
Total persons injured	25,888

But the reports do not cover the total mileage of the country; only 92,792 per cent. of it. If the accident rate was the same on the roads not reporting, the total number killed was 5,638, and the total number injured 27,898. These are the returns made by the railroad companies themselves, and they cannot well be suspected of exaggeration. Neither is there, on the other hand, any reason to suppose that they are not, in most cases, complete and prepared with perfect good faith.

Some estimate of how great this hazard is in the case of one class of employés may be made from the records of the Brotherhood of Railroad Brakemen, an organization that has for one of its objects the insurance of its members against death or total disability. During the year 1888 the average membership of this brotherhood was 10,052.5. Insurance has been paid upon 114 deaths and 53 total disabilities, the result of injuries received from railroad cars during that year. In the same time there were only 31 deaths and six total disabilities from natural causes. These data are taken from the printed assessment notices of the order. Thus one in every 88 of the members of this organization is killed yearly, and one in 60 suffers either death or total disability. It appears also that a brakeman has only 31 chances in 145 or 1 in 4.7 of being allowed to die a natural death.

No record is kept showing the number of lesser injuries received, but if the ratio of killed to wounded is taken as the same as that which, according to the figures quoted above, holds good in accidents to railroad employés over the country at large, namely, 1 to 9.73, the number of those receiving injuries serious enough to be reported to the Commission would be, exclusive of the 1,109, or one in nine of the members of the order. It would appear from this result that, besides running great danger of death, a brakeman will, on the average, be injured once for every nine years of service.

The history of automatic couplers is given in some detail, with an account of the legislation on the subject and the development of the M. C. B. type. Equal care is devoted to the subject of continuous brakes. Stress is laid upon them in diminishing collisions, decreasing bad effects of derailment, and preventing accidents by falling from cars. The annual losses from this cause are estimated by the Commission as: Killed, 613; injured, 4,025.

The obstacles to the introduction of continuous brakes are much the same as those in the case of automatic couplers; first cost, about \$50 per car, and the need of simultaneous action by many railroads.

Wherever freight trains are run for long distances without being broken up upon roads which do not employ a large proportion of foreign cars, the conditions are favorable for continuous brakes. The greater part now in use are found west of the Missouri River. On the other hand, short lines doing most of their business in the cars of other roads cannot well adopt them.

Early in the year 1887 the phrase "the deadly car stove" began to be familiar. Its deadly nature was not

then a new discovery. Often before, as at Ashtabula, in December, 1876, it had added the horror of fire to the others which attend a railroad accident. But as yet no persistent public demand had been made for its abolition, possibly because the public had not realized that a substitute was practicable. As soon, however, as the traveling public began to believe that stoves were dangerous and could be dispensed with it became the aim of every enterprising road, solicitous for its popularity, to do away with them as fast as possible. Nor was the public in all cases content until its protests had taken an authoritative form. In Massachusetts, New York and Michigan statutes were passed in 1887, the aim of which was to make the use of common stoves in passenger cars illegal after the winter of 1887-88. The legislators of 1887 overestimated what it was practicable for railroads to do. They underestimated the necessity for heating cars separately. In Connecticut the commissioners, empowered by the Legislature, issued, in December, 1887, an order that all new passenger cars built or purchased for use in the state must be equipped for continuous heating. This order was generally disobeyed, and the Commission, after further investigation, condones, in its last report, this disobedience on the part of the roads, and intimates that it was justified by the unsatisfactory working of the continuous-heating appliances.

Upon the whole it appears that the more progressive railroad managers have shown energy in this matter, and a sincere purpose to extend the use of continuous heating as fast as practicable. The present condition, however, is far from satisfactory, and towards the essential point of uniformity it is not apparent that any real progress has been made.

Mention may here be made of the block system and of interlocking, to encourage wider use of which would undoubtedly be a part of the duty of any Federal agency taking cognizance of such matters.

This Commission is not prepared to recommend a national law prescribing appliances. It does not assume to say that such legislation will never be advisable, but it is not prepared to say that it is advisable at present. It is impossible to say what the results of such a law would be, but there is no certainty that they would be good. If it did not bring about uniformity—and there is no assurance that it would—it would be most injurious to all interests involved, including those of public safety.

While it is no doubt highly desirable that results be reached as soon as possible, it is still more desirable that no mistakes be made. Nothing could be more unfortunate than a repetition, on an enormous scale, of the unsatisfactory results of state legislation. If the state statutes of a few years ago regarding couplers had been national statutes, it seems plain that the question would be in less hopeful condition than it is at present. The effect of that legislation was to hasten the adoption of a variety of automatic couplers, most of which must of course be set aside if uniformity is to be attained. In fact, the strongest opposition to the Master Car Builders' type of coupler—the one that, so far as can be seen, has most chance of uniform adoption—is found in New England, where, as a result of state legislation, automatic couplers not of that type have secured a strong hold. A reasonable prudence and regard for the lessons of previous experience require that action involving the compulsory use of particular appliances should be undertaken only with the greatest caution, and upon more thorough investigation than has as yet been practicable. It has been suggested that, for the present at least, the interests of safety would be better served by providing for a board of specialists, so constituted as to command respect from both the railroads and the public, whose business it would be to make investigations and recommendations relating to railroad casualties.

Much praise is given to the inspections of the Board of Trade in England.

Employés.—On the part of the labor organizations it is made to appear that there has been a very general adoption of something in the nature of a mutual insurance system on the assessment plan, whereby in case of injury or disability from sickness the beneficiary draws a stated weekly allowance, or, if death ensues, his family is made sure of a sum that will at least suffice to remove immediate want. There is every evidence that this insurance feature has the hearty support of the several brotherhoods or orders, and is greatly to the advantage of the members.

Of eighty-two railroad companies reporting, twelve appear to have instituted insurance funds in the interests of their men; five others have hospital funds; five have benefit associations, supported wholly by employés; one contributes annually \$500 for a like purpose, and one contemplates starting an insurance department at an early day. Fifty per cent. of the lines heard from furnish eating or lodging houses to their employés needing them. Twenty of them provide technical education to a greater or less extent, but in all cases where no regular technical training is supplied as such training the apprenticeship system prevails, or men are selected who have proved their competency by actual service. It is plain from the responses obtained from both classes that with the growth of closer relations between employés and the corporations not only are the interests of both greatly promoted, but the public is assured of better and more efficient transportation service.

In reviewing the general results of the act, the Commission states that its work has been hitherto primarily educational, as a means of promoting a better general understanding, but adds that the time has come when more aggressive steps can properly be taken. No excuse can longer be made that the law is not understood, or that sufficient time for conformity has not elapsed.

The proposed amendments to the law itself are trifling. Some other matters deemed necessary to be provided for by additional legislation would perhaps be more appropriate for new or supplemental sections to the act than as amendments to existing sections. They are:

First—The prohibition of the payment of commissions by one railroad company to ticket agents of another railroad company for passenger transportation, and the like prohibition of commissions for soliciting or procuring traffic to outside organizations or persons.

Second—The abolition of ticket brokerage, by requiring, as elsewhere suggested in this report, that every person who sells passenger tickets shall be duly authorized by the company for which he sells, and exhibit his authority, and that the company shall be responsible for his acts. If deemed practicable, the price at which the ticket may be sold might also be required to be stamped upon the ticket. And further, requiring companies that sell excursion tickets to redeem unused coupons.

Third—The regulation of the payment of car mileage for the use of cars of private companies or individuals.

Fourth—An extension of the law to make it apply to common carriers by water.

The Pikes Peak Rack Railroad.

The work of grading this road is progressing very rapidly. From timber line down about four miles the grading is finished. On the lower three miles from the foot up, about 400 men are at work, and that part will be finished in six weeks, leaving nothing more to be done than from timber line up about 2½ miles. Half of this is already finished, but work cannot be carried on there before spring, because there is now considerable snow, and the air is very windy and cold. In the lower regions of the mountain the weather is fine and warm, and no delay is apprehended from this source.

The Johnson Co., of Johnstown, Pa., will furnish the rack. The Baldwin Locomotive Works have a contract for three locomotives, and the Wason Manufacturing Co., of Springfield, Mass., for six passenger cars, each seating 50 persons. If the rack rail can be delivered so that tracklaying can commence on April 1, a strong effort will be made to open the road for traffic on July 1.

TECHNICAL.

Locomotive Building.

Nine mogul and six ten-wheel locomotives were purchased by the Oregon Railway & Navigation Co. during the past year.

The Brooks Locomotive Works built two freight and one passenger engine for the Cleveland & Canton last year.

The Schenectady Locomotive Works have built one 12-wheel freight engine with 20 x 26 cylinders, and weighing 131,000 lbs., for the Beach Creek road, and also one passenger engine with 17 x 24 cylinders and weighing 85,000 lbs.

The Chicago & Northwest had six engines built at the Baldwin Locomotive Works last year.

The Pittsburgh & Lake Erie has in service five locomotives recently completed by the Pittsburgh Locomotive Works.

The Pennsylvania lines west of Pittsburgh received the following new engines during 1889 for the southwest system: 11 class "O" passenger, 20 class "S" consolidation freight, 11 class "M" heavy shifting and one class "Q" light shifting, a total of 43. At the Allegheny and Fort Wayne shops of the Northwest system 38 engines were also built; 13 class "M" shifting at the former and 25 class "S" freight at the latter. Ten more class "S" engines are to be built at once at the Fort Wayne shops.

The Pittsburgh & Western this week placed another large order for locomotives.

The Lake Shore & Michigan Southern had 25 locomotives built by the Schenectady Locomotive Works during 1889. The engines are classified as follows: Three 18 x 24 passenger; ten 19 x 24 moguls, freight; five 17 x 24 moguls, freight, and seven 18 x 24 six-wheel switching. It is reported that this order has been recently duplicated.

The Brooks Locomotive Works have delivered two of the large switching engines which it is building for the Cleveland, Cincinnati, Chicago & St. Louis. The company has received eight of the heavy freight engines building for it.

The Michigan Central has just completed at its Jackson shops a new six-wheel switching engine with 18 x 24 in cylinder and weight of 93,000 pounds on the drivers.

The order for the 50 locomotives given by the Pennsylvania to the Baldwin Locomotive Works, which was referred to last week, is not a new order. During the past year the Pennsylvania has placed orders with the Baldwin Locomotive Works for 50 freight engines, and of these 25 have been delivered and 25 are yet to be built. The Philadelphia & Seashore Short Line has placed an order with the same company for six American type locomotives, four for high-speed passenger trains and two for freight and accommodation passenger train service.

Car Notes.

The Elliott Car Works, Gadsden, Ala., last year built 1,400 cars. New machinery is now being put in, which will increase the annual capacity of the works by about 1,000 cars. They are now building 200 box cars for the Iron Car Co., 100 dump coal cars for the Birmingham & Sheffield & Tennessee River road, and 100 dump coal cars for the Alabama Great Southern.

The Missouri Car & Foundry Co. has built about 7,350 freight cars in the last year. This is the largest output reported for the year by any of the works.

Twenty-one passenger cars and 1,281 freight cars were built for the Pennsylvania lines west of Pittsburgh in 1889 as follows: 21 passenger, 7 baggage and 3 postal, a total of 31. Of the freight cars, 930 were box, 100 stock, 151 gondolas and 100 platform. Besides this equipment there were built in addition 316 freight cars at the Allegheny shops and 1,063 freight cars at the Fort Wayne shops. Thirteen passenger, 14 baggage and two baggage and mail cars were also built at the Allegheny shops. The Fort Wayne shops built 240 refrigerator, 565 box and 258 gondolas, and the Allegheny shops built 281 gondolas, 20 ore dump and 15 caboose cars.

The Central of New Jersey has had 30 engines built at eastern works during the year. Five were passenger engines, with 19 x 24 cylinders. The diameter of the drivers is 68 in. Twenty-five of the engines were heavy consolidation freight locomotives, which had 20 x 24 in. cylinders, the diameter of the drivers being 50 in.

The Chicago & West Michigan has built at its shops during the past year, two eight-wheeled 18 x 24 locomotives, two combination baggage and smoking cars.

By outside parties there were built for the same road 104 furniture cars, four 50,000 capacity box cars and 130 platform cars 50,000 capacity each.

At the Detroit, Lansing & Northern shops there were 21 platform and three box cars built and placed in service, and also three passenger cars.

The Mobile & Ohio built 296 freight cars at the company's shops at Whistler, Ala., during the year ending Dec. 31. The company purchased during the same period four eight-wheel engines and six ten-wheel engines.

For the Pennsylvania lines east of Pittsburgh there were built last year 5,835 freight cars, 114 passenger cars and 1,43 locomotives.

Following is a list of the cars purchased by the Central of New Jersey in 1889: 25 passenger, 25 eight-wheel Wickes'

refrigerator, 250 eight-wheel box cars, of 25 tons capacity, and 1,500 eight-wheel hopper gondola cars, of 25 tons capacity.

The Chicago, Rock Island & Pacific has purchased during the year 12 passenger cars, 9 tourist sleepers, 700 box, 100 double deck stock and 3 baggage, mail and express cars.

The Pullman Palace Car Co. is building two passenger cars for the Cincinnati, Hamilton & Dayton, to run between Cincinnati & Toledo.

The Minneapolis, St. Paul & Sault Ste. Marie finished a new dining car at its Minneapolis shops last week.

The Jackson & Sharp Co., of Wilmington, Del., has the contract for building the passenger cars for the Kennebec Central road. The freight cars for the road will be built by W. H. Dyer, of Strong, Me.

The Indianapolis Car & Mfg. Co. built 3,899 cars in 1889. The average number of men employed was 672. The works were idle but a few days in mid-summer. The capacity of the works is now 25 cars a day. The company has enough orders to keep busy for four months. Most of the cars built last year were coal and box cars. The works during the year built cars for the following roads: Chesapeake & Ohio, "Big Four," Chicago, Burlington & Quincy, Louisville & Nashville, Kentucky Union, Jacksonville & Southeastern, Choctaw Coal road, Missouri, Kansas & Texas, the Pittsburgh & Lake Erie, Ohio & Mississippi, and the Lake Shore & Michigan Southern.

Bridge Notes.

J. C. Slaymaker, of Lancaster, Pa., and others who were appointed to examine the locations for a proposed bridge, will recommend the erection of a bridge over the Pequea Creek between Conestoga Centre and Marticville.

The Louisville, New Orleans & Texas has completed an iron draw bridge across the Big Black River near Vicksburg, Miss.

The Mayor of San Antonio, Tex., has asked proposals until Feb. 1 for the construction of three open truss bridges over the San Antonio River.

The New York, Providence & Boston will build a new bridge over the Seekonk River at India Point in connection with the extensive improvements to be made at Providence, R. I.

The Dominion Bridge Co. last week loaded a train of 28 cars at its works at Lachine, P. Que., with new steel bridge work for the Canadian Pacific. Another train for the same company will shortly be loaded. The bridge company has orders in hand for the Grand Narrows bridge, Nova Scotia; the Grand Trunk, Vandreuil & Prescott, Canada Atlantic, Drummondville County, and Quebec & Lake St. John roads.

Jan. 20 is the last day upon which bids will be received for the bridge over the Grand River in Eagle County, Colo. The bids must be under \$5,200. J. P. Maxwell, Barclay Block, Denver, is State Engineer, and has charge of the work.

The following bids for the erection of two iron bridges in Val Verde County, Tex., were received: Missouri Valley Bridge & Iron Works, \$4,390, \$682; Pittsburgh Bridge Co., \$4,910, \$736; King Iron Bridge & Mfg. Co., \$4,430, \$690; Penn Bridge Co., \$4,620, \$612; George E. King Bridge Co., Des Moines, Ia., \$4,510, \$636; Kansas City Bridge & Iron Co., \$4,936, \$715; Iron Substructure Co., Columbus, O., \$992.71, \$1,290.50; Berlin Iron Bridge Co., East Berlin, Conn., \$3,984, \$516. The contract was let to the Berlin Iron Bridge Co., for the two bridges at \$4,500.

The central pier of the bridge being built over the Mississippi River at Memphis, Tenn., is above water, and the caissons are being sunk for the other piers.

During the present year the Rome, Watertown & Ogdensburg has completed bridges at Sugar River, Albion, McConnellsburg, Oswego, Brewerton and Hannibal in New York. A wrought-iron three-span lattice-deck bridge over the Oswegatchie River at Gouverneur is under contract, as is also a plate girder 39 ft. long over the highway at the same place. Both bridges are to be completed this month. A contract has also been made for a wrought-iron pin-connected bridge, 125 ft. span, over the Mohawk River at Utica.

Manufacturing and Business.

The works of Ryan & McDonald, at Waterloo, N. Y., are running to their full capacity and working 13 hours a day. The firm has received some very large orders for cars, hoisting engines and locomotives the past week, and shipments of derricks, fittings, hoisting drums, winches and other supplies have also been very large.

The Harrisburg Car Co., of Harrisburg, Pa., has recently ordered seven of the Ridgway balanced cranes for its car-wheel foundry. These cranes each save 55c. per day in wages, increase the output 10 per cent. and expedite the work generally. The Glasgow Iron Co., of Pottstown, Pa., has also lately ordered a Ridgway balanced crane for unloading and weighing steel ingots.

The Secretary of State of Illinois has issued a charter to the Economy Car Door Co., of East St. Louis, to manufacture castings and fixtures for freight and refrigerator car doors. The capital stock is \$150,000. The incorporators are John C. Wands, C. T. Westlake and Spencer Munson.

Recent sales of engines by the Westinghouse Machine Co. have included the following: Philadelphia & Reading, two 45 H. P. standard engines; New York Central & Hudson River road, 45 H. P. standard; Illinois Steel Co., fifth order, 125 H. P. standard; Westinghouse Brake Co., 12 engines, 80 H. P. compound, and 25, 45 and 75 H. P. standard type; Whittaker Iron Co. and Utica Pipe Foundry, 35 H. P. junior each; Otis Steel Co., Cleveland, O., 35 H. P. compound, and West Superior Iron & Steel Co., 15 H. P. junior type.

The Pennsylvania Rolled Steel Car Wheel Co., of Norristown, Pa., has been chartered. The capital stock of the company is \$1,000,000. The company will probably soon erect works.

Iron and Steel.

The Swindell & Smythe Co., of Pittsburgh, has the contract for the construction of several iron plants, whose total cost will be \$75,000. They are: Open hearth regenerative furnaces for the Ben Atka Co., of Newark, N. J.; three furnaces for the Tyrone Mfg. Co., and additional plants for several Ohio and Western Pennsylvania firms.

The Reading Iron Co., of Reading, Pa., has been experimenting with the steel made by the Carpenter Steel Co., of Reading, and has given an order for a quantity of it for making pipe-cutters' tools. A test of a tool made of this steel was recently made at the pipe mill, and was in every way satisfactory.

The Lackawanna Iron & Coal Co., of Scranton, Pa., has given its employés an increase in wages, amounting to about 10 per cent. It is also stated that the Scranton Steel Company will give its employés a similar advance. The employés of Carnegie's Homestead Steel Works were notified by the firm of the new scale of wages last week. The advance in wages will, it is stated, average about 1½ cents per ton. The scale has not been arranged, but will be before the month expires.

The sheet mill of the Brooke Iron Co., at Birdsboro, Pa., has been closed down on account of the large amount of iron on hand. Two mills of the company, employing 250 hands, are now idle.

A contract for steel ship plates was concluded in Duluth, Minn., last week, by the American Steel Co. with Andrew Carnegie. The contract calls for about 5,000 tons of steel plates, costing over \$300,000. It will furnish plates enough for seven vessels of the McDougal type, which are to be built this year.

Extensive improvements are now being made in the Bessemer steel department of the Juniata Iron & Steel Works of Shoenberger & Co., of Pittsburgh. The manner of conveying the molten metal to the converters is to be changed and a new five-ton converter added.

The De Bardeleben Coal & Iron Co., of Birmingham, Ala., is to build four more new furnaces at Bessemer and open several new coal mines in the near future. The furnaces will be 17 ft., with a capacity of 120 tons each, like those of the present plant, of which they will be an extension.

The Rail Market.

Steel Rails.—The market continues quiet, and no large transactions are reported in the East or at Chicago. Pittsburgh mills are reported to have recently taken orders for between 30,000 and 40,000 tons, including 15,000 tons for the Louisville & Nashville and a similar quantity for the Missouri, Kansas & Texas. Prices are firm at \$35 at mill in the East and at Pittsburgh; Chicago quotes \$37.50.

Old Rails.—Little business is reported in the East or at Pittsburgh, the quotations at the latter place being \$28 for iron and \$23.50 @ \$24 for steel rails. In the East \$28 @ \$28.50 is quoted for tee rails. At Chicago sales of iron rails have been made at \$26.50, and of steel rails at \$20.50 @ \$20.75 and \$21 @ \$21.25, according to length.

The Grant Locomotive Works.

The Grant Locomotive Works, of Chicago, were chartered in Illinois last week to manufacture locomotives and other machinery. The capital stock is \$800,000; the incorporators are: E. T. Jeffrey, George M. Rogue and Willard T. Block. The locomotive plant, at Paterson, N. J., is to be removed to Chicago, as already mentioned. Mr. E. T. Jeffrey, recently General Manager of the Illinois Central, will probably be President of the company. Six hundred and fifty acres of land have been purchased in Cicero, one of the recently annexed suburbs of Chicago, at a cost of \$600,000, and works will be built by the end of next year capable of turning out 250 locomotives a year. Employment will be given to from 1,200 to 1,500 men. The stock will be owned almost entirely in the West, the only Eastern men in the company being Mr. R. S. Grant and his partners in Paterson.

Signals for Grade Crossings in Illinois.

The Illinois Railroad and Warehouse Commissioners have issued a set of rules to govern the construction of interlocking signals at railroad grade crossings. Interlocked derailing switches must be provided in all directions. On level track these must be placed 300 ft. from the fouling point. On descending grades they must be enough farther away to give the same measure of safety; but on ascending grades no deduction from the 300 ft. limit is to be allowed. On low-speed routes the position of derailing switches is not prescribed, but the same measure of safety must be assured. On single track roads derailing points must, in case of a curve, be on the inside thereof when practicable. On double track roads they must be on the outside rail in both tracks. Home signal posts must be 50 ft. from the derailing point. The distance between home and distant signals must be 1,200 ft. or more. Signal posts should be placed on the engineman's side. The highest speed over a crossing should be 12 miles an hour for fast trains, and eight miles an hour for slow trains. The commissioners may require additional safeguards where safety seems to demand it.

A Canadian Transfer Boat.

The steel ferry transfer boat "Canadian," built by the Polson Iron Works Co., at Owen Sound, Ont., for the Canadian Pacific has been launched. It is the first vessel of the kind built in Canada. The dimensions are as follows: length over all, 295 ft.; beam over guard, 71 ft.; beam, 41 ft.; molded depth, 17 ft.; tonnage, 2,000 tons. The cost is about \$300,000. The boat is fitted with two sets of engines and two paddle-wheels, 30 ft. in diameter, each worked separately. The bow is fitted with ice-crushers. The capacity will be 16 passenger cars.

The Fox Pressed Steel Products.

A brief description of the uses of Fox pressed steel in England will be found in the following, from a paper read by Mr. Perry F. Nursey, Past-President of the Society of Engineers, England, on "Fox's System of Solid Pressed Steel Wagon Frames." The author first pointed out that the invention grew out of Mr. Samson Fox's corrugated boiler flues, which have so largely added to the efficiency and endurance of marine boilers. It was in connection with the flanging of these flues that Mr. Fox gave his attention to hydraulic pressing, and this in time led him to the production of locomotive side-frames and the under-frames of rolling stock generally. This is effected by powerful hydraulic presses of large size, which produce and reproduce with perfect accuracy all kinds and shapes of frames from Siemens steel produced at the works. The plate to be flanged is operated upon simultaneously over the whole of its surface, and the flanges are formed either inward or outward, as may be required. At the Leeds Forge Works the steel is made by means of three 15-ton Siemens-Martin furnaces. The plates are taken to the pressing department, where they are heated to redness, placed between dies, and subjected to a steady hydraulic pressure of 850 lbs. per square inch. The materials used are chemically tested as they enter the works, and the products, both chemically and mechanically, at every stage of manufacture. In the steel, so far as the chemist is concerned, the object is to get .10 of carbon. Mechanically, it must stand a tensile strain of from 24 to 26 tons per sq. in., with an elongation of from 25 to 30 per cent. in 10 in. In the bending test the steel has to stand the temper test prescribed by the Admiralty, the Board of

Trade and Lloyd's. The author then described the different kinds of coach and freight car frames produced at the Leeds Forge Works on Fox's system, which were illustrated by diagrams and models. They included frames for the following railroads: The Great Northern, the Great Western, the London & South-Western, the Lancashire & Yorkshire, the North-Eastern, besides Belgian, Spanish, Indian, Japanese and American lines. Summing up the practical advantages of the system, the author observed that while the ordinary wood and iron frame weighed 4 tons 14 cwt., Fox's pressed frames only weighed 3 tons 14 cwt. Hence a saving of 1 ton or 20 per cent. per wagon of dead weight hauled, the lighter wagon being well able to carry all that the heavier one did. Another advantage was, that whereas wood frames were valueless at the end of the wagon's life, the value of the steel frames as scrap was always that of pig iron. Other advantages were—interchangeability, duplication of parts and longer life in rolling stock on account of the elasticity of the frames. Fewness of parts was also an important feature, there being only about 14 parts in one of Fox's frames, as against 47 in frames as ordinarily constructed.

The Panama Canal.

The canal, as is well known, has entirely ceased, but the canal has not been abandoned to the mercy of the elements, as is commonly believed. Large forces of workmen are constantly engaged in painting the machinery and doing what is needful for its protection. A very large portion of the plant of the canal is well housed in sheds, where it is safe enough, and roofs have been erected over excavators and other heavy machinery where it stood when work was discontinued. So far as could be seen, careful attention has been paid to the preservation of the minor parts of all machinery, and the condition of the plant seems to be exceptionally good when the nature of the climate is considered. A commission of engineers will visit the isthmus during the month of December, whose first duty will be to take an inventory of the entire equipment of the company, and then to consider once more the threadbare question as to the practicability of completing the work for any reasonable sum of money.—Correspondence *New York Evening Post*.

Boiler Explosions in Great Britain.

The seventh report on the working of the Boiler Explosions Act of 1882 by Mr. Thomas Gray, states that during the 12 months ended June 30 preliminary inquiries have been held in 67 cases. By the explosions thus dealt with 33 persons were killed and 70 injured. The annual average of explosions inquired into during the six preceding years was 47, and of lives lost 30. In upward of one-third of the cases investigated the explosions occurred on board vessels. It is pointed out that while information of every explosion on board ship can be obtained through the officers of the Board of Trade, unless an explosion in the case of land boilers attended by loss of life or from some other cause is noticed in the public press, the Department has no means of ascertaining its occurrence if the owner of the boiler omits to report the fact; and there is good reason to think that many casualties occur to land boilers which escape official inquiry.

The use of defective or worn-out boilers again constituted the cause of about one-half the explosions inquired into, while defective design or construction and undue working pressure accounted for nearly one-third, and ignorance or recklessness of the attendants about one-sixth of the total. Seven explosions from boilers of tramway engines occurred during the year, and as five of these were of a similar character and arose from similar causes—the wasting of the brass tubes from the action of the gases from coke fuel and the scouring effect of ashes and cinders—it would seem, adds the report, that the persons intrusted with the inspection of boilers of this class are not sufficiently alive to the necessity for frequently drawing a few of the tubes for examination.—*The Engineer*.

The St. Clair Tunnel.

In our last issue it was said that progress was interrupted for 36 hours on account of difficulty with soft clay. It appears that there was no such interruption, but that continuous progress has been made. Last month 483 ft. of tunnel was completed, although there was considerable soft clay encountered on the Canadian side.

Block Signaling on the Erie.

It is doubtless well known now that the Erie has the tower system of block signals on its main line from Jersey City to Newburg Junction, 45 miles, with the Sykes block. In extending the block system further it is not proposed to use Sykes blocks, but to employ the plain tower system and bell code. It is said that the remainder of the Eastern Division and part of the Delaware Division as far west as Lackawaxen will shortly be protected in this way. The suburban lines of the Erie in the neighborhood of New York are already protected by station blocks with semaphores for line signals and the bell code for communication between the operators. The blocks between Newburg Junction and Lackawaxen will be spaced as nearly uniform as practicable, and signal towers where necessary will be built between the stations. The material for this work has been contracted for.

For the Improvement of Common Roads.

With the purpose of increasing knowledge of and interest in the methods of making and maintaining public roads, it has been arranged by the University of Pennsylvania to offer prizes for papers on the subject. The following are the conditions of competition for the prizes offered by the committee for the best three papers on Road Making and Maintenance:

1. The competition shall be open to all, and will be under the auspices of the University, with the advice of the committee.

2. The subject should include the engineering, economic, and legislative features of construction, reconstruction, and maintenance, and the advantages of thoroughly scientific treatment, but omit history, excepting where necessary to illustrate or impress an argument.

3. The papers should be terse, logical, and original (not compilations), written on one side of a sheet only. It is preferred that they should be in type-writing. A paper may be the joint production of two or more persons.

4. The author's name should not appear upon his paper nor be otherwise prematurely disclosed, but his name and address should be inclosed in a sealed envelope attached to his paper in such manner that it may be readily removed without injury. The papers and envelopes will be correspondingly numbered as received, and the envelopes will remain unopened until after awards of prizes or honorable mention are determined upon, when only those will be opened which correspond to the successful numbers; the rest will be destroyed and the identity of the writers remain unknown.

5. All communications should be addressed to Dr. Will-

Sam Pepper, Provost, University of Pennsylvania, Philadelphia, Pa., and be presented on or before April 5, 1890. The papers received will be submitted to a board of five or seven adjudicators, to be appointed by Dr. Pepper with the advice and consent of the committee, which board shall be the sole judges of all papers, and will not consider any paper that fails to comply with these conditions. They shall report, if possible, within one month from the date of receiving the papers. The vote of a majority of the board upon the merits of any paper shall be final.

7. For the paper adjudged to be entitled to the first prize there shall be paid four hundred dollars.

For the paper adjudged to be entitled to the second prize there shall be paid two hundred dollars.

For the paper adjudged to be entitled to the third prize there shall be paid one hundred dollars.

Honorable mention may be made of other contributions, at the discretion of the Board of Adjudicators.

8. When the adjudication shall be made and reported to the provost he shall call a meeting of the committee, at which meeting he shall open the envelopes corresponding with the successful papers and award the prizes in accordance with the adjudication to the authors then disclosed and entitled to receive them.

The papers for which prizes have thus been paid shall become the property of the University for early publication, after which it is proposed by the committee to invite a second competition for the best drafts of legislative bills designed to carry out the features developed by the first competition.

General Railroad News.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Canadian Pacific, 2½ per cent., payable Feb. 17.

Cumberland Valley, quarterly, 2 per cent., payable Jan. 1.

Detroit, Hillsdale & Southwestern, 2 per cent., payable Jan. 6.

Iron, 1½ per cent., payable Jan. 10.

New Haven & Derby, 1 per cent., payable Jan. 10.

Paterson & Hudson, 4 per cent., payable Jan. 2.

Paterson & Ramapo, 4 per cent., payable Jan. 2.

Pittsfield & North Adams, 2½ per cent., payable Jan. 1.

Rock Island & Peoria, 2½ per cent., payable Jan. 1.

Rome, Watertown & Ogdensburg, 3 per cent., payable Feb. 15.

St. Paul, Minneapolis & Manitoba, quarterly, 1½ per cent., payable Feb. 1.

Shore Line, 3½ per cent., payable Jan. 9.

Ware, 3½ per cent., payable Jan. 1.

Wilmington, Columbia & Augusta, 3 per cent., payable Jan. 10.

Wilmington & Weldon, 4 per cent., payable Jan. 15.

Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Chesapeake & Ohio, special, Pace House, Richmond, Va., Jan. 20.

Columbus, Hocking Valley & Toledo, annual, Columbus, O., Jan. 14.

Croton Valley, special, 48 Wall street, New York City, Jan. 14.

Indianapolis, Decatur & Western, special, Indianapolis, Ind., Jan. 30.

Little Miami, annual, Cincinnati, O., Jan. 28.

Louisiana North & South, annual, Gibsland, La., Jan. 15.

McKeesport & Belle Vernon, annual, 111 Fourth avenue, Pittsburgh, Pa., Jan. 13.

M-Keesport & Bessemer, annual, 111 Fourth avenue, Pittsburgh, Pa., Jan. 13.

New York, Ontario & Western, annual, 16 Exchange Place, New York City, Jan. 15.

Rome, Water oval & Ogdensburg, annual, 96 Broadway, New York City, Dec. 28.

S. Catharine & Niagara Central, annual, St. Catharines, Ont., Jan. 27.

St. Louis, Vandalia & Terre Haute, annual, Greenville, Ill., Jan. 21.

Western Counties, annual, Yarmouth, Nova Scotia, Feb. 12.

Western New York & Pennsylvania, annual, 242 South Third street, Philadelphia, Pa., Jan. 13.

Railroad and Technical Conventions.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *American Society of Civil Engineers* will hold its next annual meeting at the rooms of the Society, 127 East Twenty-third street, New York City, Jan. 15, at 10 o'clock.

The *Ohio Society of Surveyors and Civil Engineers* will hold its next annual meeting in Columbus, Ohio, beginning Jan. 21.

The *Association of American Railway Accounting Officers* will hold a regular meeting at the St. Charles Hotel, New Orleans, La., Jan. 22.

The *Motor Car Builders' Association* will hold its next annual convention at Old Point Comfort, Va. Rooms should be secured of Mr. F. N. Pike, manager, Hygeia Hotel, Fortress Monroe, Va.

The *New England Railroad Club* meets at its rooms in the United States Hotel, Beach street, Boston, on the second Wednesday of each month, except June, July and August.

The *Western Railway Club* holds regular meetings on the third Tuesday in each month, except June, July and August, at its rooms in the Phenix Building, Jackson street, Chicago, at 2 p. m.

The *New York Railroad Club* meets at its rooms, 113 Liberty street, New York City, at 7:30 p. m., on the third Thursday in each month.

The *Central Railway Club* meets at the Tift House, Buffalo, the fourth Wednesday of January, March, May, August and October.

The *Northwest Railroad Club* meets on the first Saturday of each month in the St. Paul Union Station at 7:30 p. m.

The *American Society of Civil Engineers* holds its regular meeting on the first and third Wednesday in each month, at the House of the Society, 127 East Twenty-third street, New York.

The *Boston Society of Civil Engineers* holds its regular meetings at Boston, at 7:30 p. m., on the third Wednesday in each month. The next meeting will be held at the American House.

The *Western Society of Engineers* holds its regular meetings at its hall, No. 67 Washington street, Chicago, at 7:30 p. m., on the first Tuesday in each month.

The *Engineers' Club of St. Louis* holds regular meetings in St. Louis on the first and third Wednesdays in each month.

The *Engineers' Club of Philadelphia* holds regular meetings at the house of the Club, 1,122 Girard street, Philadelphia.

The *Engineers' Society of Western Pennsylvania* holds regular meetings on the third Tuesday in each month, at 7:30 p. m., at its rooms in the Penn Building, Pittsburgh, Pa.

The *Engineers' Club of Cincinnati* holds its regular meetings at 8 p. m. on the third Thursday of each month at the Club rooms, No. 24 West Fourth street, Cincinnati.

The *Civil Engineers' Club of Cleveland* holds regular meetings on the second Tuesday of each month, at 8:00 p. m., in the Case Library Building, Cleveland. Semi-monthly meetings are held on the Fourth Tuesday of the month.

The *Engineers' Club of Kansas City* meets at Kansas City, Mo., on the first Monday in each month.

The *Civil Engineers' Society of St. Paul* meets at St. Paul, Minn., on the first Monday in each month.

The *Montana Society of Civil Engineers* meets at Helena, Mont., at 7:30 p. m., on the third Saturday in each month.

The *Civil Engineers' Club of Wichita* holds regular meetings on the first Wednesday in each month at Wichita, Kan.

Master Mechanics' Circulars.

We have received committee circulars from the Master Mechanics' Association, as follows:

PLACING FIRE-BOX ABOVE THE FRAMES.

1. Do you consider it an advantage to place the fire-box above the frame; if so state your reason.

2. Do you experience any more difficulty in keeping mud rings and flues from leaking when above frame than when below?

3. State the distance from bottom of mud ring to bottom row of flues.

4. Is your ring set level or does it drop in front; and if dropped in front, state your reason for that method of construction.

5. Are your mud rings double riveted all around, or only in corner?

6. In placing the fire-box above the frame, does it run straight across, or drop in middle?

7. What depth of fire-box would you recommend?

8. Does your fire-box stand level, or do you dish your frame toward the front end?

9. What increase of grate surface do you obtain by raising fire-box above the frame?

10. Do you experience any more trouble with driving boxes heating with fire-box above frame?

11. Do you have any more trouble with flues stopping up with fire-box above frame than below, and what is the diameter of flues used?

12. Do you use water bars or grates, and for what kind of coal?

13. Do you use brick arch with fire-box above frame?

14. Please state in a general way what advantages or disadvantages, if any, you have derived from placing fire-box above the frame.

In answering foregoing questions please send blue prints and give full information.

Replies to be sent to Fred. B. Griffith, M. M., D. L. & W. Ry., Buffalo, N. Y.

CORROSION OF WATER TANKS.

What are the best means and the economy of preserving locomotive tanks from corrosion? Have you, in repairing tanks, used any method or device to prevent the corrosion usually observed on top sheets, and those sheets forming the coal pit? If members know any means of preserving water tanks not referred to in this circular, they are requested to send particulars.

Replies to be sent to W. J. Robertson, Superintendent M. P. C. V. R. R. St. Albans, Vt.

FORM AND SIZE OF AXLES FOR HEAVY TENDERS.

1. Are you in favor of an axle for heavy tenders with or without end collars?

2 and 3. Give dimensions of axle as preferred.

4. Which one of the three forms in use of axle between the wheels do you approve, and why? viz.: Straight from shoulder of wheel seat to centre; reduced a short distance inside of the wheel seat; a curve from wheel seat to centre.

5. What is the limit of weight on journals per square inch of contact?

By a heavy tender your committee understands one that, when loaded, will carry, say, about 3,600 gallons of water and about 16,000 lbs. of coal. The committee desire all the information they can get on this subject, and to that end they request that your answers be not confined to the questions in the circular.

Answers should be addressed to Wm. Swanston, M. M., Chicago, St. Louis & Pittsburgh Railroad, Indianapolis, Ind.

Northwest Railroad Club.

The annual meeting of the Northwest Railroad Club was held in the director's room at the union depot in St. Paul, on Saturday, Jan. 4, at 7:30 p. m. The election of officers for the coming year and the President's annual address constituted the principal business.

The Engineers' Club.

On the evening of Thursday, Jan. 16, the club will give a reception to the American Society of Civil Engineers in the club house. In consequence of this reception table d'hôte dinner announced for that evening has been postponed one week to Thursday evening, Jan. 23.

The annual meeting of the club for the election of officers and other business will be held in the club house on Tuesday evening, Jan. 14, at eight o'clock.

At the regular monthly meeting of the club, held Thursday evening, Dec. 5, a committee was appointed to nominate officers for the ensuing year.

The nominations are as follows:

President: Charles Macdonald, New York City.

Vice-Presidents: J. C. Bayles, New York City; J. F. Holloway, New York City.

Treasurer: A. C. Rand, New York City.

Secretary: David Williams, New York City.

Trustees (to serve three years): James A. Burden, Troy, N. Y.; Horace See, New York City; John C. Kafer, New York City; John Bogart, New York City; Eckley B. Coxe, Drifton, Pa.

House Committee: John Stanton, Alfred L. Beebe, Geo. W. Bramwell, Geo. A. Just, Harry de B. Parsons, New York City.

Membership Committee: Theo. Voorhees, Pierre de P. Ricketts, Geo. W. Maynard, W. H. Wiley, Ed. Wegmann, Jr., F. H. Clement, E. G. Spilsbury, New York City; P. F. Brendlinger, Yonkers, N. Y.; J. B. Mackintosh, Hoboken, N. J.

PERSONAL.

—Mr. Patrick Towhy, Assistant Superintendent of the Nebraska Division of the Union Pacific at North Platte, Neb., has resigned and has been succeeded by Mr. W. H. Burns.

—Mr. G. W. King, who has been acting General Freight and Passenger Agent of the Mobile & Ohio, since the resignation of Mr. John L. G. Charlton a year ago, has been appointed General Passenger Agent.

—Mr. William Fitzgerald, Trainmaster of the Northern Division of the Grand Rapids & Indiana, has been given charge of the division, until a successor is appointed.

—Mr. T. A. Whitmore, formerly Assistant General Freight Agent of the Chicago, St. Paul & Kansas City, has been appointed General Agent of the Atchison Topeka & Santa Fe, at St. Louis, to succeed Mr. N. T. Spoor, resigned.

—Mr. Samuel Garwood, who has been connected with the New Jersey lines of the Philadelphia & Reading since 1871, has been appointed Managing Director of the line. Mr. William H. Blood succeeds him as Superintendent of the Atlantic City road.

—Mr. W. P. Harris, formerly General Superintendent of the St. Joseph, St. Louis & Santa Fe, has been appointed Superintendent of Construction and General Manager of the Charleston, Cincinnati & Chillicothe, with headquarters at Johnson City, Tenn.

—Mr. G. M. Farley, formerly Engineer of Maintenance of Way of the New York & New England, and who was appointed Superintendent of the Springfield & Western divisions of the road last November, has resigned that position to become Assistant Engineer on the Pennsylvania lines west of Pittsburg.

—Mr. Charles A. Cairns, formerly chief clerk in the passenger department of the Cleveland, Columbus, Cincinnati & Indianapolis, and editor of the "Bee Line Gazette," but since last April chief clerk in the passenger department of the Chicago, St. Paul & Kansas City, has been appointed Assistant General Passenger and Ticket Agent of the latter road at Chicago.

—Capt. W. W. Peabody, General Superintendent of the Trans-Ohio division of the Baltimore & Ohio division, became Vice-President and General Manager of the Baltimore & Ohio Southwestern on Jan. 4. This company is operated by the Baltimore & Ohio, and is a reorganization of the Cincinnati, Washington & Baltimore, more of which Mr. J. H. Stewart was General Manager.

—Mr. John Hornby, General Superintendent of the Fort Worth & Rio Grande, has been elected President to succeed Mr. B. B. Paddock, resigned. Mr. Hornby has also been elected General Manager, and the position of General Superintendent has been abolished. Mr. Robert Lord, General Freight and Passenger Agent of the road, has been elected Secretary and Mr. J. Van Rensselaer, Auditor, has been elected Treasurer.

—The Chicago, Santa Fe & California is to be merged with the Atchison, Topeka & Santa Fe, and the authority of the general officers of the latter road is to be extended over the former. Mr. A. A. Robinson has been appointed General Manager of the Chicago, Santa Fe & California, and Mr. J. F. Goddard, Third Vice-President and General Manager, has been appointed Traffic Manager of the entire system of the Atchison, Topeka & Santa Fe, in charge of passenger and freight traffic.

ELECTIONS AND APPOINTMENTS.

—*Atchison, Topeka & Santa Fe*—T. A. Whitmore has been appointed General Agent at St. Louis, Mo., to succeed N. T. Spoor, resigned.

—*Atlantic City*—Mr. Samuel Garwood has been appointed Managing Director of the Atlantic City road, in charge of traffic and the general commercial interests of the company. Mr. William H. Blood has been appointed Superintendent at Atlantic City, N. J., in charge of the transportation and roadway service, and will report to the Managing Director.

—*Baltimore & Ohio Southwestern*—At a meeting of the stockholders of the company at Cincinnati, Jan. 4, the following board of directors was selected: E. R. Bacon and H. W. Poor, of New York; Orlando Smith, W. T. McClintick, W. W. Peabody, Lowe Emerson and E. H. Ahns, of Cincinnati; William P. Harvey, of Baltimore; Patrick Berthan and George Hopkinson, of London, Eng., and Amos Smith, of Chillicothe, O. The board of directors organized by electing as officers: E. R. Bacon, President; W. W. Peabody, Vice-President; William E. Jones, Treasurer; and Charles Lowe, Secretary.

—*Birmingham Mineral*—C. A. Davies has been appointed Assistant Superintendent at Birmingham, Ala., to succeed B. F. Dickson, promoted. Samuel Calloway, Assistant Roadmaster, has been appointed Roadmaster, to succeed C. A. Davies.

—*Boston & Maine*—Frank Jones, of Portsmouth, N. H., has been elected President of the road to succeed George C. Lord, resigned.

—*Chesapeake & Ohio*—George W. Stevens, Division Superintendent at Richmond, has been appointed General Superintendent of the road at Richmond.

—*Chicago, Milwaukee & St. Paul*—J. S. Talbott has been transferred to Denver, with the title of General Agent. William M. Winton has been appointed Passenger Agent at St. Joseph, Mo., to succeed J. S. Talbott.

—*Chicago, St. Paul & Kansas City*—The following promotions and appointments took effect Jan. 1: C. A. Cairns has been appointed Assistant General Passenger and Ticket Agent, office in the Phoenix Building, Chicago. F. H. Lord has been appointed Assistant General Passenger Agent, with office at 188 Clark street, Chicago.

—*Cincinnati Southern*—Richard Carroll, General Superintendent, has been appointed General Manager, with office in Cincinnati, to succeed John C. Gault, resigned. C. C. Harvey, Vice-President, on Jan. 1, assumed charge of the traffic departments. The General Freight Agent and the General Passenger and Ticket Agent now report to the Vice-President. Charles H. Davis, has been appointed Comptroller, vice C. C. Harvey, with office at Cincinnati.

—*Fort Worth & Rio Grande*—At a special meeting of the Board of Directors, held at Fort Worth, Tex., Dec. 27, three directors resigned and their places were filled by election. The board now stands as follows: H. B. Hollins, J. S. Ellis and C. M. Wicker, New York; John Hornby, B. B. Paddock, W. A. Huffman, E. W. Taylor, W. F. Lake and Richard Lord, Fort Worth. The officers are: John Hornby, President; C. M. Wicker, Vice-

President; Richard Lord, Secretary, and J. Van Rensselaer, Treasurer. A. L. Robinett has been appointed Auditor.

Illinois Central.—The office of the President has been removed from New York to Chicago. The following appointments have been made: C. A. Beck, Acting General Manager, to be General Manager, with office at Chicago; A. W. Sullivan, Acting General Superintendent, to be General Superintendent, with headquarters at Chicago; E. G. Russell, Acting Superintendent of Lines in Illinois and Wisconsin, to be Superintendent of Northern Lines, with headquarters at Chicago, and with jurisdiction over the lines of railroad north of the Ohio River, and east of the Mississippi River. The title of M. Gilleas, Superintendent of Lines in Iowa has been changed to that of Superintendent of Western Lines, with headquarters at Dubuque, Ia., and with jurisdiction over the railroads west of the Mississippi River, which are operated by, or for account of the Dubuque & Sioux City. The lines south of the Ohio River will be designated as "Southern Lines" as heretofore, and J. G. Mann continues as Superintendent of Southern Lines, with headquarters at New Orleans.

Iowa Central.—Thomas P. Barry has been appointed Assistant General Passenger Agent, with office at Marshalltown, Ia., to succeed A. D. Dwelle, resigned.

Knoxville, Cumberland Gap & Louisville.—J. B. Munson has been appointed General Freight and Passenger Agent, with office at 218 Main street, Knoxville, Tenn.

Lake Shore & Michigan Southern.—George H. McIntire has been appointed General Agent at Youngstown, O. He has been succeeded as Superintendent of the Franklin, Youngston & Sharon branches of the road by Mr. T. W. Niles, Assistant Superintendent, with office at Youngstown.

McKe sport & Duquesne.—The following directors have been elected: E. P. Douglass, President; J. C. Smith, O. S. Weddell, E. F. Wood and Thomas Reynolds, of McKeesport, Pa.

Middle ovn & Hummelstown.—The officers of the company are: Hon. John W. Rife, President; C. W. Raymond, Secretary; George H. Grove, Treasurer, and James I. Chamberlain, Solicitor. The office is in Midtown, Pa.

Milwaukee, Lake Shore & Western.—Ernest Vliet, who for some months has been Acting General Passenger Agent of the road, has been appointed General Passenger Agent, with office at Milwaukee, Wis. W. F. Herman has been appointed Eastern Passenger Agent, with headquarters at Buffalo, N. Y., and C. P. Kennedy Southern representative, with headquarters at Cincinnati.

Mobile & Ohio.—G. W. King has been appointed General Passenger Agent of the road, with office at Mobile, Ala.

Z. J. Ferguson having resigned, George Manuell has been appointed Master Mechanic, with charge of the Locomotive Department of the Mobile Division, North.

New York Central & Hudson River.—Frank A. Harrington, formerly Agent at Troy, has been appointed Assistant Superintendent of the Mohawk & Hudson Division, with office at Albany, and with especial charge of the freight transportation between New York and De Witt.

New York, Susquehanna & Western.—Simon Borg has been elected President of the road, at New York City, to succeed Charles M. Heald, resigned.

Northern Central.—C. A. Preston has been appointed Assistant Engineer of the Baltimore Division, vice Mr. L. H. Barker, transferred, with office at Baltimore, Md.

Norwich & Worcester.—The stockholders of the company held their annual meeting in Worcester, Mass., Jan. 8, and elected the following directors: Edward L. Davis, W. Bayard Cutting, Thomas B. Eaton, Joseph A. Clarke, William A. Slater, George H. Ball, Francis H. Dewey, Jeremiah Halsey and A. George Bullock. M. M. Whittemore, of Norwich, was elected Secretary and Clerk in place of Edward T. Clapp, who has served since June, 1856. At a subsequent meeting of the directors George H. Ball, of Boston, was elected President.

Piedmont & Potowac.—M. E. Ingalls, of Cincinnati; C. H. Coster and Samuel Spencer, of New York; W. J. Robertson and T. O. Barlow, of Virginia, are the corporators of this Virginia road.

Raleigh Springs.—The officers of the company are: J. T. Fargason, President, Memphis; D. J. O'Connell, Vice-President, Chattanooga, and E. Scott, General Manager, 528 Second street, Memphis, Tenn.

Red River, Sabine & Western.—The following are now the officers of this company: L. W. Lloyd, Marshall, Tex., President; W. F. Lake, Fort Worth, Vice-President; C. C. Allen, Fort Worth, Secretary; I. H. Hollis, San Augustine, Treasurer, and I. C. Terry, Fort Worth, Chief Engineer.

Rome, Watertown & Ogdensburg.—Isaac H. McEwen has been appointed Superintendent of the Western Division, at Oswego, N. Y., to succeed Edgar Van Etten, elected Manager of the Buffalo Car Service Association.

St. Augustine & North Beach.—The officers of the company are: President, Virgil Powers; Vice-President, E. B. Watson; Secretary, C. W. Hendricks; Engineer and Treasurer, J. N. Hazelhurst, St. Augustine, Fla., and directors W. S. Wright, L. R. Wright, Wm. Scanlath and W. H. Carson.

South Florida.—T. W. Henry has been appointed Assistant Auditor, with office at Sanford, Fla. J. W. Kelly has been appointed Traveling Auditor, vice T. W. Henry.

South Sioux Falls.—The following are the officers of this company: R. F. Pettigrew, President; S. L. Tate, Vice-President and General Manager; C. G. Ferguson, Secretary, and J. C. Barton, Chief Engineer and Superintendent; all of Sioux Falls, So. Dak.

Terre Haute & Indianapolis.—The stockholders met in Terre Haute, Ind., Jan. 6, and elected the following board of directors: W. R. McKeen, Henry Ross, D. W. Minshall, Josephus Collett, John G. Williams, Herman Hulman and George E. Farrington. The board of directors organized by electing the following officers: William R. McKeen, President; John G. Williams, Vice-President and General Manager; George E. Farrington, Secretary, and John W. Crutt, Treasurer.

Terre Haute & Logansport.—The stockholders of this company held their annual meeting in Terre Haute, Ind., and elected the following Board of Directors: W. R. McKeen, John G. Williams, D. W. Minshall, Geo. E. Farrington and Frank McKeen. The Board of Directors met subsequently and elected W. R. McKeen, President, and Geo. E. Farrington, Secretary and Treasurer.

Troy & New England.—The following officers have been elected: President, Walter P. Warren; Vice-President, William A. Thompson; Treasurer, Joseph J. Tillingshast.

West Shore.—John B. Davis has resigned the office of Assistant Superintendent of the Buffalo Division and, has been succeeded by C. H. Ketchum, formerly Station Agent at Buffalo.

OLD AND NEW ROADS.

Alleghany & Kinzua.—The company has under consideration an extension to connect the Pennsylvania and New York ends of the road and a branch south from Sugar Run Junction, Pa., toward the Kinzua Valley, about 20 miles. The contract for the lines will probably be let early in the spring. C. D. Williams, of Bradford, Pa., is Superintendent. W. B. Parsons, 35 Broadway, New York City, is Chief Engineer.

Anson & Abilene.—This is a proposed road from Anson, in Jones County, Tex., to Abilene, on the Texas & Pacific, a distance of about 28 miles. It is intended to continue the line to Coleman, on the Atchison, Topeka & Santa Fe, 65 miles from Anson. The residents of the county have appointed a railroad committee to arrange for the building of the road and the committee is endeavoring to enlist outside capital. It has prepared statistics of the probable freight traffic, and thinks the road will prove profitable from its opening. The county is in western Texas, and has a population of 5,000 people, but has no railroad within its limits. It shipped 2,000 bales of cotton the past year, which had to be hauled to Abilene, and it now has 200,000 bushels of grain stored for lack of transportation facilities. The survey has not yet been made, but the country is level and engineers estimate that the road can be graded and bridged for \$23,000 per mile. H. A. McEachin, of Anson, is Secretary of the railroad committee.

Astoria & South Coast.—Grading has been finished between Astoria and Seaside House, Or., 18 miles. Between Skipanon, Clatsop County, and Carnahans, Or., six miles, the tracklaying has been finished. Between Carnahans and Seaside, seven miles, the bridges are being built and track is now being laid. The bridging is under way between Astoria and Skipanon, five miles. Grading is in progress from Clatsop Junction to Hillsboro, Washington County, Or., a distance of 86 miles. On this section eight miles of the grading has been finished.

Baltimore & Eastern Shore.—The company has executed a first mortgage for \$500,000 to the Mercantile Trust & Deposit Co., of Baltimore. A second mortgage for \$200,000 has also been made. The company some time ago secured the passage of a bill by the Maryland state legislature, authorizing the City of Baltimore to vote the sum of \$500,000 in aid of the road and also authorizing various counties to vote subsidies. The city of Baltimore was to be given a first mortgage and the counties which voted any bonds were to be given a second mortgage. The city of Baltimore failed to vote any amount, but several counties did authorize the issuing of bonds for the road. Numerous complications have since occurred, and the company has not yet received any of the bonds. The counties now claim that the first mortgage should be made in their favor, the city of Baltimore having refused to vote any bonds. This company refuses to do, insisting that the second mortgage is all they can claim.

Castine & Bangor.—Surveys are now being made from Bangor to Milo, Me., 38 miles, through Kenduskeag, Corinth and Charleston. The surveys from Castine to Bangor, 33 miles, have all been made. The road will connect with the Canadian Pacific at North Brownville via the Katahdin Iron Works Railroad. The survey now in progress will be finished in two or three weeks' time. Several offers have been made to furnish capital to construct the road, and the company will probably accept one of these in a short time. A. M. Devereux, of Bangor, is President.

Centralia & Chester.—The road is now completed and in operation from Sparta, on the Mobile & Ohio, northeast to Coulterville, Ill., on the Cairo Short Line, a distance of eight miles. Between Coulterville and Centralia, 33 miles, the line has been nearly all graded, and the survey has been finished to Salem, on the Ohio & Mississippi. The company has a charter to extend the line 45 miles beyond Centralia to Altamont, to a connection with the Wabash and St. Louis, Vandalia & Terre Haute. This section it is expected to complete this year. It is also intended to extend the line from Sparta southwest to either St. Genevieve, Mo., or Chester, Ill., on the Mississippi River.

Central of New Jersey.—This road is now running passenger trains over the Poughkeepsie bridge. Mail and freight trains have been running for some time. From Phillipsburg to Belvidere, N. J., the trains are run over the Pennsylvania road, thence over the Lehigh & Hudson River road to Greycourt, N. Y., and thence over the Orange County line to a connection, near Montgomery, N. Y., with the Central New England & Western, which runs to and over the Poughkeepsie bridge.

Central Ohio.—At the meeting yesterday of the stockholders of this company as reorganized at Columbus, O., Jan. 2, to consider the question of leasing at Columbus & Cincinnati Midland, there were 44,681 votes cast in favor of the proposed lease and none against it. Both roads are operated lines of the Baltimore & Ohio.

Cerdan.—Tracklaying on this Mexican line has reached Tacubaya and the grading has been completed as far as Mixcoac. Orders for the rolling stock are now being let.

Charleston, Cincinnati & Chicago.—Forty miles of the section between Johnson City, Tenn., and Minneapolis, Va., has been graded, and tracklaying has been commenced at Johnson City. About two miles has been laid north from that point. Grading is also in progress between Rutherfordton and Marion, N. C., 25 miles. It is expected to complete this section by Jan. 1 next. The line to Minneapolis, 90 miles from Johnson City, will probably also be finished soon after that date.

Chicago & West Michigan.—On the extension from Baldwin north to Traverse City, Mich., a distance of 75 miles, tracklaying has been finished from Baldwin to

the Manistee River, 20 miles, and is also in progress from Traverse City south, eight miles being finished from that point. The grading has been practically finished on the entire line. Only a small force is now working, on account of the weather. The extension will probably be ready for traffic by April.

Cincinnati Circular.—The surveys and estimates have been completed for this road, which is to be built around the north side of Cincinnati, O., from Red Bank to the West End. The distance is ten miles. The company is now making arrangements for building the road, and expects to have the work started by April 1. H. H. Tatem, of Cincinnati, is Secretary.

Cincinnati & Green River.—Surveys are still being made for the proposed extension of this road from Yosemitte, Ky., westward through Adair and Metcalf counties. About 18 miles of the location has been completed, and an alternative line is now being run. George C. Harper, of Cincinnati, is Chief Engineer.

Cincinnati, Saginaw & Mackinaw.—This is the new name of the Toledo, Saginaw & Mackinaw, and not the Cincinnati, Jackson & Mackinaw, as was stated in error last week.

Clarion River.—The survey for this road, which was chartered in Pennsylvania late in December, was begun Dec. 17, and is now in progress, under the charge of B. E. Wellendorf. The road is to extend from near Carmon on the Ridgway & Clearfield, and Buffalo, Rochester & Pittsburgh roads, down the Clarion River to Hallton or the mouth of Spring Creek. The distance is about 12 miles. There will be one bridge 300 ft. long, and probably two smaller ones. W. H. Hyde, of Ridgway, Pa., is President.

Denver Short Line.—This is the name of the road which the Denver & Rio Grande proposes to build to shorten the present route between Denver and Leadville, Colo. The line has been surveyed, but no date for letting the contracts has yet been decided upon. The eastern terminus will be near Acequia station on the Denver & Rio Grande, 13 miles south of Denver. The western terminus is Buena Vista. The distance is 113 miles. The route is up the cañon of the South Platte to South Park, over Trout Creek Pass, at Hilltop Station on the Colorado Midland, and down Trout Creek Valley to Buena Vista. The work will be in cañons and difficult. The maximum grades will be 1.88 ft. per 100, or 99.26 per mile. The maximum curves will be 10 degrees. There will also be a number of iron bridges with 27 spans ranging from 80 to 150 ft., the total length being 2,755 ft. Twenty-one tunnels ranging from 90 to 625 ft. will be necessary. The total length is 6,507 ft.

Empire & Dublin.—Tracklaying on the western extension has been finished for a distance of 11 miles to a point within two miles of Hawkinsville, Ga., and the grading has been completed to that town. Ten miles of tracklaying has been completed on the extension from Empire east to Dublin. When the road is completed to these points it will be 31 miles long. It is proposed to begin work very soon on an extension from Hawkinsville west, about 15 miles, to a point on the Georgia Southern & Florida. R. S. Payne, of Empire, Ga., is Chief Engineer.

Fairhaven & Southern.—Twenty-one miles of this road is now completed from Fairhaven, on Bellingham Bay, Whatcom County, W., to Sedro on the Skagit River in Skagit County. Grading has been completed from New Westminster, B. C., south 25 miles to the international boundary line. The line has been located and the right of way partly cleared from the boundary line to Fairhaven, 25 miles. The location has also been made for 17 miles south of the Skagit River from Sedro toward Seattle, and grading is now in progress on this section. The preliminary survey has been made for nearly 100 miles up the Skagit River and over the Cascade Mountains to Lake Chelan. Nelson Bennett, of Tacoma, is President.

French Broad Valley.—Proposals for grading, masonry and trellising on the first 30 miles of this North Carolina road from Asheville will be received until Jan. 21 by C. G. Dyott, President and General Manager, 52 Wall street, New York City, or H. M. Ramsur, Superintendent and Chief Engineer, Asheville, N. C.

Grand Occidental.—Over 300 men are reported as being still at work on this road between St. Jerome and St. Sauveur, Que. The line is to be continued northwest to Lake Nominigue. H. J. Belmer, of Montreal, is the contractor.

Houston, Central Arkansas & Northern.—Track laying is progressing at the rate of 1½ miles a day on the section from Mer Rouge, La., northward to McGehee Station in Desha County, Ark. The sub-contracts have all been let by E. P. Reynolds & Co., the general contractors, who have an office at Dermott, Ark. P. A. Mangant & Co. have the contract for tracklaying. The road will probably be completed by April 1. A. K. Nash, of Chicago, is Chief Engineer.

Indianapolis & Vincennes.—Tracklaying on the Gosport branch of this road has been completed, and the line will be ready for operation as soon as the bridge over the White River has been finished. The branch is four miles long, and reaches some valuable stone quarries.

Lancaster & Hamden.—About six miles of track has been laid on this road, from the junction of the Cincinnati & Muskingum Valley road to Tarlton, O. Tracklaying will soon commence at Straitsville. About 20 miles of grading has been completed ready for tracklaying. The entire road from Tarlton south, a distance of 60 miles, to Wellston is reported under construction. E. P. Buell & Co., of Lancaster, O., are the contractors.

Louisiana, North & South.—On the extension from Gibsland, La., south towards Alexandria, the grading has been finished to the new town of Bienville, a distance of 16 miles. Tracklaying has been finished for 12 miles south of Gibsland. When the southern extension has been finished, work will be commenced on the extension from Homer, La., north 60 miles into Arkansas.

Louisville, Hardinsburg & Western.—This road has been built from Hardinsburg, 40 miles west of Louisville, to Irvington, a distance of 50 miles, and was opened for regular traffic Jan. 7.

Louisville & Nashville.—The grading has been completed on four sections of this road, which are being double-tracked, and the second track is now being laid. The sections are: Anchorage, Ky., to East Louisville, 10.2 miles; South Louisville to Shepherdsville, Ky., 15.3 miles; Edgefield Junction, Tenn., to East Nashville, 8.6 miles; and from Boyles, Ala., to Oxmoor, Ala., 9.7 miles,

McKeesport & Bellevernon.—It is stated that this road, which has been recently completed between Bellevernon and McKeesport, Pa., 28 miles, has passed into the control of the Pittsburgh & Lake Erie. It is stated that the price was \$1,400,000. Negotiations had been in progress for some time for the sale of the road to the Pennsylvania, but as an agreement with that road was not made the sale was made to the Pittsburgh & Lake Erie.

Midland (Indiana).—The New York Loan & Trust Co. in the proceedings against this company, and its president, Harry Crawford, has, since Judge Gresham's refusal to appoint a receiver for the road, petitioned for an order directing the company to pay a note for \$1,380,000, now past due, and an instalment of interest due Jan. 2. Judge Gresham issued an order demanding that the company pay the interest on \$1,110,000 of its bonds, and he will decide what action to take as to the payment of the note on Jan. 13, when he will hold a hearing at Chicago.

Montana Central.—The tracklaying on the Neirhart branch has been finished from Allen, Mont., on the Sand Coulee branch to Beulah, and the grading is in progress to Monarch, Mont., 43 miles beyond Allen. This station is 10 miles southeast of Great Falls and is the junction of the Sand Coulee and Neirhart branches.

Northern Central.—Press dispatches state that this road will probably be extended from its present northern terminus at Canandaigua, N. Y., northwest about 21 miles to Rochester, N. Y., making that city its northern terminus. The Chamber of Commerce of Rochester has been working to secure the extension for some time, and has offered inducements to the company to build to that city.

Pennsylvania.—Many of the contracts on the new line from Downingtown to Morrisville have been let. Thomas Cavan, of Washington, D. C., and Brendlinger & Mairres, of New York, have each the contracts for the sections, within a mile of each side of the Schuykill River. John T. Dyer, of Norristown, Pa., has two miles in Bucks County, near the North Penn road. Ryan & McDonald, of Waterloo, N. Y., have three sections from one mile east of the Schuykill, in Plymouth township, to Henderson Summit, in Upper Merion Township. This contract embraces the deck truss bridge which will span the Schuykill. The structure will be about 1,000 ft. long, resting on nine stone piers. Charles McFadden, of Philadelphia, has four sections and John A. Kelly two sections. The contracts for the grading and masonry of all that portion of the route in Montgomery County have been awarded.

Pennsylvania & Northwestern.—At special meetings of stockholders of the Clearfield & Jefferson and Bell's Gap roads, held in Philadelphia last week, it was decided to consolidate the roads under the above name, the consolidation to take effect Jan. 1, 1890. The capital stock of the new company will be \$1,660,000 and the bonded indebtedness \$1,000,000. This is a slight increase in both the capital stock and bonded debt of the roads.

Pennsylvania, Poughkeepsie & Boston.—The engineers who were surveying the extension of this road from Slatington to Harrisburg, Pa., about 90 miles, succeeded in obtaining two good lines between the points named, and have been called in. They may, however, be again put in the field to revise their surveys. One route is about six miles shorter than the other, but has heavier grades. It has not yet been decided which of the lines to adopt. The contract for building the extension has not yet been formally let, but, as already stated, will probably be awarded to Andrews & Warner, of 202 Broadway, New York City.

Piedmont & Potomac.—A bill has been introduced in the Virginia legislature to incorporate this company to construct a road from Quantico or some other point on the Potomac to a point on the Chesapeake & Ohio, east of the Blue Ridge Mountains. The design is to give the Chesapeake & Ohio direct connection with the Pennsylvania road. The authorized capital stock is \$50,000,000. Another bill was introduced authorizing the Chesapeake & Ohio to purchase or construct a branch over this route.

Port Clinton Short Line.—The grading and tracklaying on this road make slow progress, but it is claimed that the line will be opened for traffic early in the spring. The road is to extend from Port Clinton to Kingsway, O., 12 miles. Connection with the Wheeling & Lake Erie is made at Kingsway, and the company has made a trackage agreement with that road to run trains into Tremont, eight miles.

Richmond, Petersburg & Allegheny Connecting.—This company has applied to the Virginia Legislature for a charter to build a belt road through and around Richmond, Va. The capital stock is placed at \$2,500,000. This line is in opposition to the belt line which the Richmond & Petersburg and Richmond & Fredericksburg & Potomac are endeavoring to build about Richmond, to connect the two lines and avoid the heavy grades, and relieve the crowded tracks of the present connection through the city. Property-owners have enjoined the companies from building the belt line. They also object that the belt line would be non-taxable, as are the Richmond & Petersburg and Richmond, Fredericksburg and Potomac. The new company, if chartered and built, could be taxed. Bradley T. Johnson, of Baltimore, is one of the organizers.

St. Augustine & North Beach.—This road, which extends from the Union Station in St. Augustine, Fla., to the beach on the Atlantic Coast, will probably be opened next week. The erection of a drawbridge has delayed the opening of the road.

San Antonio & Aransas Pass.—The Waco branch of this line having been extended 18 miles north from West Point to Giddings, Tex., it was opened for business on Jan. 1.

Spokane Falls & Northern.—Tracklaying is now in progress from Colville, W., north, and the road will probably be completed to Marcus, on the Columbia River, 103 miles north of Spokane Falls, Wash., by Jan. 20. A line has been surveyed up the Columbia River for 40 miles beyond Marcus, to the international boundary line, and this section will probably be put under contract and completed early next summer. The construction forces are now being disbanded for the winter. The maximum grade of the road between Colville and Marcus is one per cent., except for four miles where the line drops into the Columbia River valley. Here the grade is two per cent. The maximum curvature is 10 degrees. Burns & Chapman, of Spokane Falls, are the contractors. J. M. Buckley is General Superintendent, and E. J. Roberts is Chief Engineer, with offices at Spokane Falls.

Tabor & Northern.—Tracklaying has been completed on this Iowa road, and trains are now running regularly between Tabor and Malvern, a distance of 10 miles.

Texarkana & Shreveport.—Fifteen miles of this road has been completed from Boyce, Ark., to Linn. The distance between Linn and Shreveport, La., about 46 miles, will probably be finished and opened for traffic this year.

Titusville, Cambridge & Lake Erie.—A force of 40 men has recommended work on this road with the intention of laying a mile and a half of track to a large tannery. The officers claim that a large force will soon be put on to complete the road between Titusville and Cambridge, Pa., about 25 miles. The road was graded between these points some time ago, and some work was done on the bridges and culverts. The track was also laid for some distance, but it was subsequently taken up. It is believed that the work already done can be repaired at a comparatively small cost. The section between Cambridge and Erie is also partially graded. A. H. Steele, of Titusville, is President.

Tobacco Belt.—This Florida road and the Florida Midland & Georgia have been consolidated recently. Work will be started within one or two months at Valdosta, Ga. The road is being built by the Georgia & Florida Construction Co., from Valdosta through Madison, Fla., to Cedar Keys. Wm. S. Jordan, of Madison, Fla., is General Superintendent.

Troy & New England.—This company, whose incorporation was noticed last week, has ordered a survey commenced at once for the road, at Troy, to find the best route out of the city from a point on the Union road to the town of Albion, N. Y. Several surveys for the rest of the line were made several years ago, but a new one will probably be made. Walter P. Warren, of Troy, is President.

Washington, Hocking Valley & Chicago.—This is now the name of the road formerly known as the Karshner, Washington & Chicago. The company has recently placed a corps of surveyors in the field, and they are now making detailed surveys and estimates of the route from Washington Court House, O., west. Frank Johnson, of Washington C. H., is interested.

Washington & Western.—The company has a bill before the Virginia Legislature for a charter to construct a road from a point on the Potomac River near Washington, D. C., and thence to a point in Virginia on the line of the Shenandoah Valley road, and then to the West Virginia state line. The incorporators are Henry Fairfax, McK. W. Jones, R. W. Moore, Frank P. Clark, Clarence H. Clark, F. J. Kimball, D. W. Flickwir, W. C. Bullett and Joseph H. Doran.

Wheeling Bridge & Terminal Co.—The extensive terminal system in Wheeling, W. Va., and Martin's Ferry, O., which this company is building, includes a double track bridge over the Ohio River and some 10 miles of track. The bridge and a large part of the terminal tracks are well advanced towards completion. The bridge is 2,100 ft. long, has a channel span of 525 ft., and is 90 ft. above low water, the distance to the base of the rails being 97 ft. There are five river piers and two abutments and 23 stone pedestals. There will be six other bridges over streets and streams ranging in length from 20 to 300 ft. The work involves much trestling, bridging, tunneling, and many engineering problems. Two double track tunnels, 540 and 1,203 ft. long, 31 ft. wide and 27 ft. high, will be built. Paige, Carey & Co., of New York; the Edge Moor Bridge Works, of Wilmington, Del., and the Wheeling & Eastern Improvement Co., are the contractors. R. H. Cochran, of Wheeling, is President, and Job Abbott is Chief Engineer.

Williamsport & North Branch.—Contracts will probably be let within a month or two for the proposed extensions of this road. One line will be built from Nordmont, the eastern terminus, northeast to Bernice, where the line will connect with the State Line & Sullivan road. This extension is 17 miles long. The other extension is from Hall's Station to Williamsport, Pa., 10 miles.

Yadkin.—Construction work on this road has been commenced at Salisbury, Rowan County, S. C. Surveys are still in progress and the location has been finished to near Norwood, Stanly County, N. C., a distance of about 42 miles southeast of Salisbury. Theodore N. Klutts, of Salisbury, is President.

TRAFFIC.

Traffic Notes.

Live stock rates have been reduced from Nebraska points to Chicago to meet the rate of the Alton from Kansas City.

The Executive Board of the Interstate Commerce Railway Association has rendered a decision to the effect that grain rates from Nebraska shall be the same to St. Paul, Duluth, and other points in that Territory as to Chicago.

The Pensacola & Atlantic, and Pensacola division of the Louisville & Nashville, have reduced local passenger rates from five cents and four and a half cents per mile to three cents. These are the only roads in Florida to make a voluntary reduction of their passenger rates.

The Mallory Line, running a fleet of 10 steamships between New York and Galveston, has established an agency in Denver, with Mr. W. L. Wright as General Agent. Mr. Wright has been the commercial agent of the Panhandle route until accepting his present appointment.

It is said that Minneapolis dealers are getting a large amount of corn from the Union Pacific by the way of the Chicago, St. Paul, Minneapolis & Omaha, and sending it East by the "Soo" and the Canadian Pacific. It is surmised that this corn gets the benefit of the export rate.

The Chicago, Burlington & Northern has issued a tariff reducing passenger rates to Eastern points to meet those put in effect by the "Soo" line. The latter follows by a still further reduction, making the rate from Minneapolis and St. Paul to various Eastern points even less than it is from Chicago. Other Northwestern roads are reducing Chicago-St. Paul rates, and the situation has become very complicated.

The Heavy Freight Traffic.

In a recent interview General Manager S. H. H. Clark, Missouri Pacific, is reported as saying: In all my railroad experiences I've never seen anything to compare with the traffic strain under which the railroads are now staggering. The crops in the agricultural states are unusually bountiful, so heavy, in fact, that all the railroad facilities have proved inadequate. We have begged, borrowed and leased from Eastern lines

all the cars that could be obtained, and still we are short several thousand. Granaries are overflowing, and for hundreds of miles along the tracks of the Missouri Pacific system corn and other cereals are stacked unsheltered waiting for cars.

Indianapolis Live Stock Shipments.

The east-bound shipments of live stock from the Indianapolis stock yards, in the year 1889, were as follows: Over the Cleveland division of the Big Four, 4,970 cars; over the C. St. L. & P. (Pennsylvania line), 2,109 cars; over the Ohio, Indiana & Western, 558 cars; over the Cincinnati division of the Big Four, 369 cars. In this statement is included only the stock shipped east from the yards, not stock passing over the Belt road east.

Ticket Commissions.

Ticket commissions have increased since the death of the Western Passenger Association, and \$2.25 is now the ruling rate, and several of the roads are charged with paying as high as \$3. Another result of the competition is the appointment by a number of the Western roads of outside solicitors on a commission basis.

Indianapolis Belt Line Business.

Below is given the number of cars transferred over the Belt road since it was opened, in each year, except 1882 and 1883: 1884, 420,576; 1885, 457,743; 1886, 491,797; 1887, 588,830; 1888, 600,130; 1889, 660,867.

It will be noticed that 60,737 more cars were transferred over the Belt road in 1889 than in 1888. During the year all roads centering there made arrangements to move all through business over this line, instead of over the Union tracks, as three of the roads in former years had been doing.

Belt road engines, in 1889, handled 48,641 car-loads of live stock, against 40,110 in 1888; increase in 1889, 8,531 cars.

Trans-Missouri Rates.

The Executive Board of the Interstate Commerce Railroad Association has given a decision on the question of the authority of the Trans-Missouri Association to make rates to points in the territory of the Western Freight Association. The controversy arose on the action of the Trans-Missouri Association in establishing lower rates on grain from Nebraska points to St. Paul than are in effect from the same points to Chicago. This was objected to by some of the Chicago roads and by all the Chicago grain dealers. The Executive Board decides, however, that the Trans-Missouri Association had a right to authorize such rates so long as they did not effect a reduction in the rates between intermediate points in the Western Freight Association.

Corrected Weights.

Mr. Shaw, of the Chicago committee of the Central Traffic Association has collected during the year from platform and track scale corrections of shippers' weights and classifications the sum of \$75,091. The above amount represents only the shortages in freight received in small quantities. The amount collected on carload shipments has not yet been footed up for the year, but Chairman Shaw estimates it will amount to close upon \$700,000.

The Year's Freight Business at St. Paul.

St. Paul papers publish the following statement of cars received and shipped at that point in the years 1888 and 1889:

	1889.	1888.
Cars of freight received.....	154,710	158,892
Cars of freight shipped	97,339	93,065

Considerably the largest business was done by the Chicago, St. Paul, Minneapolis & Omaha system.

Tea Traffic.

The importers of the San Francisco Chamber of Commerce have appealed to the Interstate Commerce Commission against discrimination by the railroads. They claim that the policy of the roads tends to make New York the central distributing point for tea. It is complained that the rate on through bills of lading from China and Japan to transcontinental points in the United States discriminate against shipments from San Francisco to the same points. It is said that the difference in rates is sufficient to entirely cut off the San Francisco merchants from the tea business east of the Rocky Mountains.

Operations of the New York Railroads.

A compilation of the reports of 28 railroads operating in the state of New York to the Railroad Commissioners of that state shows for the year 1889 an increase of gross earnings of \$2,000,000. Eighteen roads show an increase and 10 a decrease. Eleven of the roads show an increase in the net earnings. The number of persons killed on these 28 roads was 885 last year, against 813 in the preceding year.

Decisions of the Kansas Railroad Commissioners.

The Board refuses to order additional train service on the Wichita & Western road petitioned for by citizens of Kingman. It also declines to order the Rock Island and the Burlington to build a connecting track between the two roads at Oberlin.

East-bound Shipments.

The shipments of east-bound freight from Chicago by all lines for the week ending Saturday, Jan. 4, amounted to 112,500 tons, against 102,196 tons during the preceding week, an increase of 10,304 tons, and against 103,664 tons during the corresponding week of 1888-1889, an increase of 8,836 tons. The proportions carried by each road were:

	Wk to Jan. 4.		Wk to Dec. 28.	
	Tons.	P. c.	Tons.	P. c.
Michigan Central.....	16,734	14.9	10,186	9.9
Wabash.....	3,986	3.5	3,154	3.1
Lake Shore & Michigan South.....	22,297	19.7	17,256	16.9
Pitts., Ft. Wayne & Chicago.....	8,988	8.0	11,350	11.1
Chicago, St. Louis & Pitts.....	10,691	9.5	14,688	14.4
Baltimore & Ohio.....	13,180	11.1	14,111	13.8
Chicago & Grand Trunk.....	19,607	17.4	14,688	14.4
New York, Chic. & St. Louis.....	9,977	8.9	8,888	8.7
Chicago & Atlantic.....	7,150	6.4	7,187	7.7
Total.....	112,500	100.0	102,196	100.0

Of the above shipments 9,891 tons were flour, 71,355 tons grain, 2,142 tons millstuffs, 5,421 tons cured meats, 4,001 tons lard, 7,315 tons dressed beef, 1,002 tons butter, 925 tons hides, 100 tons wool and 3,470 tons lumber. The three Vanderbilt lines together carried 43.5 per cent. of all the shipments, while the Pennsylvania lines carried 17.5 per cent.